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BULLETIN NO. 11.

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U. S. DEPARTMENT OF AGRICULTURE.

DIVISION OF AGROSTOLOGY.

[**Grass and Forage Plant Investigations.**]

STUDIES

ON

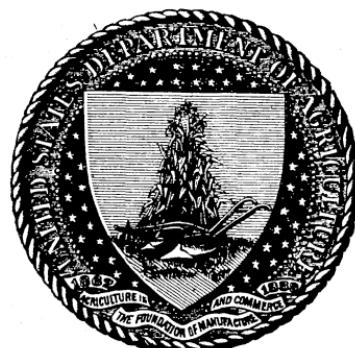
AMERICAN GRASSES.

I. A REVISION OF THE NORTH AMERICAN SPECIES OF
CALAMAGROSTIS.

By THOMAS H. KEARNEY, JR.

II. DESCRIPTIONS OF NEW OR LITTLE-KNOWN GRASSES.
By F. LAMSON-SCRIBNER.

ISSUED JULY 20, 1898.



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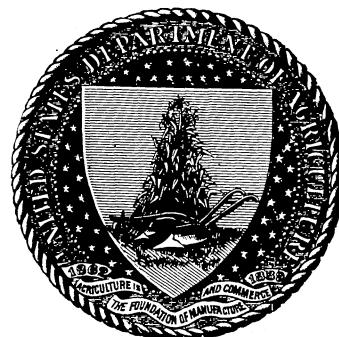
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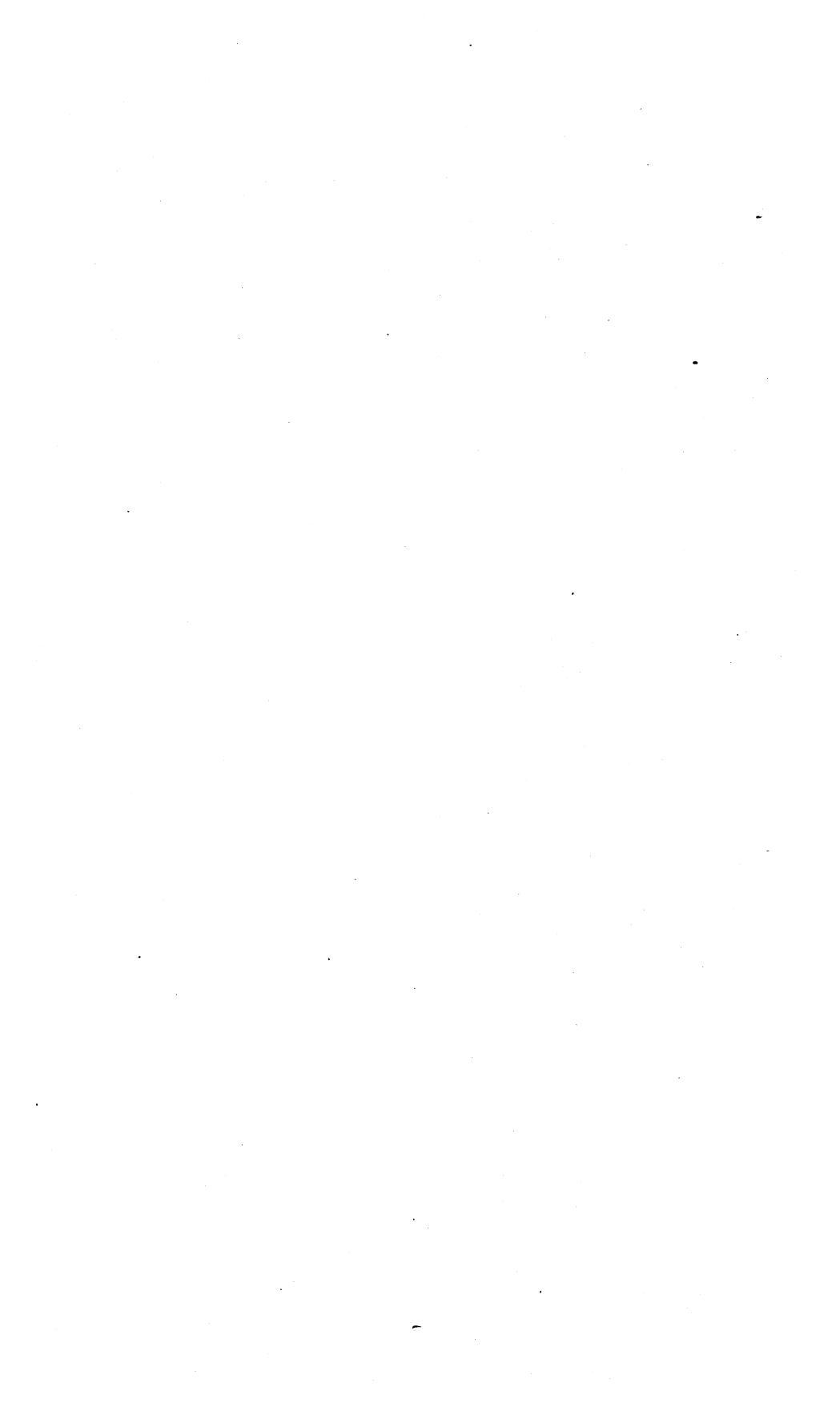
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LETTER OF TRANSMITTAL

U. S. DEPARTMENT OF AGRICULTURE,
DIVISION OF AGROSTOLOGY,
Washington, D. C., May 19, 1898.

SIR: I have the honor to transmit for your approval the manuscript of a continuation of Studies on American Grasses, embracing (1) "A revision of the North American species of *Calamagrostis*," by Mr. Thomas H. Kearney, jr., assistant agrostologist, and (2) "Descriptions of new or little-known grasses," by the Agrostologist, and respectfully recommend its publication as Bulletin No. 11 of this division. In the paper on the revision of the genus *Calamagrostis* only those species are included which occur in North America north of Mexico. All enumerated are natives, and of the thirty-eight species described thirty-three are believed to be endemic. Twenty-three species and varieties are described as new.

In the Rocky Mountain region there are twelve species, and while none are found in the Gulf States excepting in northern Georgia, they extend southward through Mexico, and the species multiply along the Andes of South America. In his enumeration of the species of *Calamagrostis* of the higher Andes Mr. H. L. Weddell characterizes sixty species. In North America the species are most abundant on the Pacific slope, where twenty-five species are known to occur.

The new species are fully described, and the synonymy and distribution of all the species included is fully presented. The keys of analysis have been made with much care, and can not fail to be found helpful in determining the species. Some of the species present so many forms that their limitation is difficult. In several cases it is impossible to draw sharp lines of separation, and this is especially true of *Calamagrostis canadensis* and *Calamagrostis langsdorffii*, also *Calamagrostis hyperborea* and *Calamagrostis inexpansa*. The descriptions and the data furnished relative to the distribution of the species are based upon specimens contained in the United States National Herbarium, and also those in the leading herbaria of the country.

That it has been possible to examine so large a series of specimens is due to the courtesy of those in charge of the several collections submitted for the purpose. Expression of thanks is here tendered to Mr. James Macoun, of the Geological and Natural History Survey of

Canada; Dr. B. L. Robinson, Gray Herbarium, Cambridge, Mass.; Dr. John K. Small, Columbia University; Mr. Stewardson Brown, of the Academy of Natural Sciences of Philadelphia; Dr. E. L. Greene, Catholic University; Mr. Theo. Holm, Washington, D. C.; Miss Alice Eastwood, California Academy of Sciences. Thanks are also due Dr. C. H. Merriam and Mr. Vernon Bailey for their kind assistance in determining the zonal limits of the species.

Respectfully,

F. LAMSON SCRIBNER,
Agrostologist.

Hon. JAMES WILSON,
Secretary of Agriculture.

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STUDIES ON AMERICAN GRASSES.

I. A REVISION OF THE NORTH AMERICAN SPECIES OF CALAMAGROSTIS.

By THOMAS H. KEARNEY, JR.

INTRODUCTION.

In North America, north of Mexico, thirty-eight species of *Calamagrostis* are known to occur, eleven of which are here published for the first time. All of these are native, no introduced species having as yet been reported. All belong to the section *Deyeuxia* Hack. (Clarion, as a genus), which is characterized by the usually hairy prolongation of the rachilla behind the palea. This prolongation is villous along its whole length to just below the apex,¹ except in *C. cinnoides*, which has the extension of the rachilla naked to just below the apex, where it bears a circle of long hairs, not unlike the pappus of some *Cichoriaceæ*. *C. cinnoides* is also unique among North American species in its pubescent caryopsis. All of our species, excepting *C. breweri*, have well-developed creeping rootstocks and at least some of the innovations extravaginal. The culms, usually simple, are sometimes branched in *C. langsdorffii*, *C. canadensis*, and *C. macouniana*.

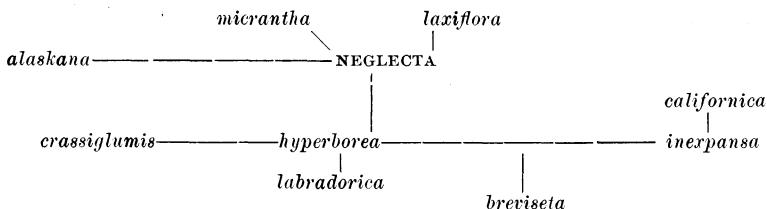
CLASSIFICATION.

A satisfactory segregation of the North American species of *Calamagrostis* is rendered difficult by their great variability and the existence of a series of intergrading forms between many that are none the less too distinct in the typical form to admit of their being united. Thus from *C. canadensis* to *C. langsdorffii* a perfect gradation can be traced. From *C. hyperborea* to *C. neglecta*, on the one hand, and to *C. inexpansa* on the other, the transition is equally uninterrupted. The consequent impossibility of sharply defining some of the species has made it expedient to regard several of these intermediate forms as varieties of one of the two connected species, although rather arbitrary characters must be used for distinguishing them. This frequency of intergradation has made the construction of a serviceable key a task of more than ordinary difficulty.

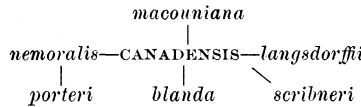
¹ Quite naked abnormally in one or two species.

As the sequence of species adopted in this revision is somewhat artificial, a brief discussion of their apparent natural relationships is here inserted. Most of the North American species can be arranged into five rather well-defined groups, represented, respectively, by *C. neglecta*, *C. canadensis*, *C. purpurascens*, *C. aleutica*, and *C. deschampsiodes*.

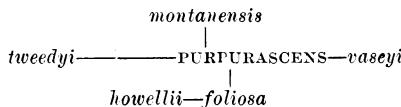
The first group is the most strongly European in its affinities. The following diagram indicates the relationships and possible genealogy of its members, the length of the connecting lines measuring to some extent the closeness of the relationship:



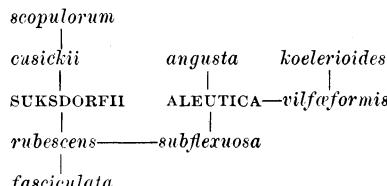
The second group is possibly derived from the *neglecta* type, although the probable line of descent is obscure. This group, like the first, is closely related to European and northern Asiatic types.



The third group is perhaps derived from the *neglecta* type through *C. hyperborea*. It is significant that both *C. purpurascens* and *C. hyperborea* are found in North America and, elsewhere, only in Greenland, and are apparently the only species with such distribution. The *purpurascens* allies are related to the European *C. sylvatica*, but are otherwise more nearly an endemic type than are the two preceding groups.



The fourth group contains two well-defined series of species, the first nearly related to *C. aleutica*, the second to *C. suksdorffii*. Through the second series this group is connected with *C. purpurascens* and its allies. Both types are purely endemic.



The fifth group is of entirely problematical relationship. With the exception of *C. deschampsiodes*, which ranges from the Pribilof Islands to Kamchatka, and is therefore more Asiatic than American, the species are endemic and are found only in the mountains of California.

breweri—lemonni—deschampsiodes—bolanderi.

Finally, *C. cinnoides* stands alone, an extremely isolated type without near relations.

GEOGRAPHICAL DISTRIBUTION.

The genus *Calamagrostis* contains approximately one hundred and fifty species, widely distributed over the globe, but in such a manner as to point strongly to a boreal origin, according to the generally accepted theory of migration during the glacial epoch, for outside of cold and cool temperate regions the species are found only on the higher mountains.

The development of numerous endemic forms in Australia and New Zealand is at first sight an obstacle to this theory of the origin of the genus, but the occurrence of scattered species on the mountains of India and the Malayan region deprives that objection of its force. The great number of species along the South American Cordilleras is perfectly in harmony with the known laws of plant distribution. The genus is at present most strongly developed in northern Europe and Siberia (twenty-five species), western North America (thirty-two species), the Andes region (seventy species), and Australia, including New Zealand and Tasmania (twenty species). There are eleven species in Atlantic North America, fifteen in Mexico and Central America, fifteen in the Himalayan-Malayan region, ten in eastern Asia, and fifteen in central and western Asia. With the exception of about ten species of the section *Epigeos* Koch, inhabiting the northern temperate regions of the Old World, all belong to the section *Deyeuxia*, which is often regarded as a separate genus, but is at best an artificial and unsatisfactory one.

Two of the thirty-eight North American species (*C. langsdorffii* and *C. neglecta*) occur also in northern Europe and Asia, two more (*C. purpurascens* and *C. hyperborea*) are found outside this continent only in Greenland, while a fifth (*C. deschampsiodes*) is common to the Pribilof Islands and northeastern Asia. The remaining species are believed to be endemic. Considering the distribution of the genus in North America from a purely geographical standpoint we find ten species in the Atlantic-Appalachian region. Of these, three extend into the Southern States, one occurring in the undulating "middle" country and in the foothills, the other two only upon the highest mountains (above 1,800 meters). The genus is not represented in Florida, Mississippi, Louisiana, Arkansas, the Indian Territory, and Texas. Some half dozen species occur in the prairie districts and the region about the Great

Lakes. Four or five are found on the Great Plains east of the Rocky Mountains. In the Rocky Mountains proper there are twelve species, of which three extend as far south as New Mexico and Arizona. On the Pacific slope from southern Alaska to California there are twenty-five species in the mountains and along the coast. On the Alaskan peninsula and islands the genus is represented by seven species.

Turning to the biologically more important distribution by life zones, whose limits are fixed by sums total of effective temperature during a definite period, we find the species pretty equally divided between the Boreal and Transition zones—a distribution to be expected in a genus of northern origin. Only a single species (*C. purpurascens*) passes timber line northward and on the higher Rockies, and becomes truly Arctic-Alpine. Several, notably *C. breweri* in the Sierra Nevada, and *C. neglecta*, *C. langsdorffii*, and *C. hyperborea* northward, extend into the upper, or Hudsonian, belt of the boreal zone, in some cases probably nearly reaching timber line. Other species, for example, *C. cinnoides* in the Atlantic States, and *C. canadensis* and *C. hyperborea elongata* in the central prairie region, occur in country which is, broadly speaking, upper Sonoran. It is probable, however, that the modifying influence of a moist habitat accounts for such extensions, and that they are to be regarded as outposts of the Transition. None of the species can be regarded as of definitely Sonoran distribution.

The following is an approximate classification of the species by zones. It must be noted, however, that the most careful and thorough field work is necessary to make possible a complete and accurate definition of the zonal limits.

1. ARCTIC-ALPINE AND BOREAL.—*C. purpurascens*.
2. BOREAL.—*C. deschampsioides*, *lemonni*, *breweri*, *foliosa* (?), *raseyi*, *tweedyi*, *aleutica*, *rubescentia*, *rubescens*, *breviseta*, *langsdorffii*, *canadensis acuminata*, *scribnieri*, *alaskana*, *laxiflora*, *neglecta*, *micrantha*, *labradorica*, *hyperborea*, *crassiglumis*.
3. BOREAL AND TRANSITION.—*C. suksdorffii*, *canadensis*, *hyperborea elongata*, *hyperborea americana*.
4. TRANSITION.—*C. bolanderi*, *howellii*, *montanensis*, *rilaeformis*, *koelerioides*, *angusta*, *subflexuosa*, *fasciculata*, *suksdorffii luxurians*, *porteri*, *nemoralis*, *blanda* (?) *macouniana*, *cusickii*, *scopulorum*, *cinnoides*, *inexpansa*, *Californica* (?).

ECOLOGY.

Plants are classed in respect to habitat and the resulting adaptations as hydrophytes (water plants), xerophytes (dry-soil plants), mesophytes (intermediate as to moisture requirement), and halophytes (salt-loving plants), the last class, however, being of decidedly less importance than the others. Nearly all the North American species of *Calamagrostis* belong to the first two classes, and the majority are hydrophytes. It is noteworthy, however, that nearly all the species, even those growing in the wettest soil, have characters that are generally supposed to belong rather to xerophile plants, such as narrow, erect, strongly involute leaf blades, short hairs or papillæ on the upper leaf surface, a thin coating

of wax giving the plant a glaucous appearance, etc. This apparent anomaly is sometimes ascribed to the coldness of a wet soil, which diminishes the water-absorbing capacity of the root system and thus renders necessary the same contrivances to prevent too rapid transpiration that we see in plants inhabiting very dry soil. The smallest amount of xerophile habit is exhibited by *C. canadensis* and its nearest allies, especially when growing in shaded ground. On the other hand, the *purpurascens* group, with the exception of *C. tweedyi*, are "bunch grasses" with marked xerophile adaptation, conspicuously glaucous, having low, strict culms with tunicated bases in strong clumps from short, strong rootstocks, thickish, strongly involute, narrow leaf blades, etc.

An absolute ecological classification of the species is impracticable, for the same species may be under different conditions either hydrophile, mesophile, or xerophile. As has already been noted, this is frequently the case with species which toward the north inhabit dry, sunny situations, but further south take refuge from the increasing heat in moist woods or cold swamps. The following classification is based partly upon that of Warming.¹ A number of species are entirely omitted, no data as to their habit being available. Others are enumerated under more than one association class.

A. Hydrophytes.

1. OPEN MARSHES AND WET MEADOWS.—*C. canadensis*, *langsdoeffii*, *scribneri*, *macouniana*, *neglecta*, *micrantha*, *laxiflora*, *hyperborea* (especially var. *elongata*), *inexpansa*, *crassiglumis*, *cinnoides*, *brrevisetata*, *bolanderi*, *deschampsiodes*, *aleutica* (possibly halophile).
2. SPHAGNUM BOGS.—*C. cinnoides* (sometimes), *alaskana* (?).
3. LOW, MOIST WOODS AND THICKETS (ALMOST A MESOPHILE ASSOCIATION).—*C. canadensis* (sometimes), *langsdoeffii* (sometimes), *blanda*, *neglecta borealis*, *suksdorffii* (normally xerophile).
4. WET CLIFFS.—*C. hyperborea americana* (sometimes), *memoralis* (sometimes).

B. Xerophytes.

1. ON OR AMONG ROCKS.—*C. purpurascens*, *raseyi*, *howellii*, *scopulorum*, *labradorica*, *hyperborea* (sometimes).
2. SANDY OR GRAVELLY SHORES OF LAKES AND RIVERS.—*C. rubescens*, *hyperborca* (sometimes), *hyperborea americana* (sometimes), *hyperborea elongata* (sometimes), *crassiglumis* (sometimes), *brrevisetata lacustris* (probably often hydrophile). It is doubtful whether this association is properly xerophile.
3. SAND HILLS.—*C. hyperborea americana* (sometimes).
4. PRAIRIES AND "BENCH LANDS."—*C. montanensis*.
5. UPLAND WOODS.—*C. porteri*, *memoralis*, *suksdorffii* (usually), *rubescens*, *purpurascens* (sometimes), *vilfaeformis*, *koelerioides*.

C. Halophytes.

COAST MARSHES.—*C. aleutica* (?).

In regard to abundance of individuals, the xerophile species are either copious or sparse, but usually scattered. (*C. suksdorffii* is an exception, for in the Cascade Mountains of Oregon and Washington it grows socially, sometimes covering the ground in the pine woods to

¹ Lehrb. der oekolog. Pflanzengeogr. Deutsche Ausgabe, 1896.

the exclusion of other herbaceous vegetation.) Species of hydrophile habit, on the other hand, are often gregarious or even social. *C. canadensis*, for example, occasionally grows in nearly pure formations, covering open swamps and meadows with an almost unmixed growth.

TERATOLOGY.

Abnormal variation of different organs is not infrequent in *Calamagrostis*, especially in specimens growing at high altitudes and latitudes. Proliferation of the spikelets, the presence of a second (staminate) flower or even a third in the spikelets, and increase in the number of nerves in the glumes, are the most common deviations from normal characters. Such deviations are sometimes, but by no means always, due to disease. The following abnormalities in various organs were noted in the material examined in the preparation of this paper:

1. Three well-developed leafy branches from one of the culm nodes (*C. canadensis acuminata*).
2. Rudimentary sheath (?) at first node of rachis of panicle extended into a several-nerved bract about 5 mm. long, having the appearance and texture of a ligule (*C. langsdorffii*): into a bract about 4 mm. long, flat, ovate, 3-nerved (*C. canadensis*): into a bract 3 mm. long, somewhat spreading, subulate, chartaceous, possibly representing a blade (*C. macouniana*).
3. Panicle deeply lobed, with the appearance of a cluster of panicles (*C. neglecta borealis*).
4. Most of the spikelets 2-flowered, one 3-flowered. In the latter case the first flowering glume subtending an undeveloped caryopsis, the second a mature caryopsis, and the third empty, the rachilla being villous between the glumes and extending beyond the uppermost one (*C. aleutica*). Many of the spikelets in some panicles 2-flowered, the second flower staminate, with well-developed but somewhat smaller anthers, the rachilla bearded between the two flowering glumes and with the usual bearded prolongation (*C. subflexuosa*). A number of spikelets in one panicle 2-flowered, the second flower staminate, with a smaller but well-developed flowering glume and palea (*C. breviseta*). A second (staminate) flower with well-developed anthers, the rachilla villous between the flowering glumes and with the usual villous prolongation (*C. purpurascens*). In one (diseased) panicle each spikelet with a second (5-nerved) flowering glume slightly raised above the first (7-nerved), both glumes having dorsal awns of about equal length and neither having paleæ, the rachilla not extended beyond the second (*C. purpurascens*). A second (staminate) flower with well-developed anthers subtended by a narrow, short-awned glume (*C. cusickii*). A second flowering glume, bearing a long, nearly apical awn (*C. howellii*). A slender awn, equaling the flowering glume, borne at the summit of the prolongation of the rachilla (*C. bolanderi*).
5. First empty glume sometimes with a faint lateral nerve (*C. purpurascens*, etc.). In an abnormal, 2-flowered spikelet, the first empty glume cleft nearly to the middle, the lobe nearly as wide as the glume itself and with a second (lateral) nerve extending from the base of the glume to the apex of the lobe; the second glume cleft to the very base, the halves each 3-nerved and each nearly as large as the normal empty glume (*C. subflexuosa*). First empty glume frequently 3-nerved and the second 4-nerved, the fourth nerve faint and disappearing a short distance above the base (*C. aleutica*).
6. Flowering glume in one spikelet 6-nerved, the sixth nerve fainter than the rest and extending into a minute lateral tooth some distance below the apex of the glume (*C. purpurascens*). Teeth of the flowering-glume sometimes 0.5 mm. long (*C. purpurascens*).

7. Palea distinctly 3-nerved in one spikelet, the mid-nerve as prominent as the keels but not reaching the apex; in this case the prolongation of the rachilla unusually well developed (*C. breviseta*). Palea 5-nerved in one specimen, the nerves nearly equidistant and equally prominent to near the apex, but only the normal keels quite reaching the apex, the palea being strongly grooved only near the base and the strongly developed prolongation of the rachilla slightly lateral; in other spikelets the two outermost nerves anastomosing with the normal keel nerves and the central one disappearing below the middle of the palea (*C. aleutica*).

The frequency of two-flowered spikelets in this genus, often when the plant is apparently quite healthy, shows how slight the dividing line between the tribes *Agrostideae* and *Aveneae* may become.

HYBRIDISM.

To what extent the species of *Calamagrostis* hybridize with one another, if at all, can only be determined by actual experiment or the closest kind of field observation. It is not improbable that natural hybrids occur in the genus. Apparent crosses of *C. hyperborea* with *C. purpurascens*, *C. hyperborea* with *C. langsdorffii* and *C. canadensis* with *C. suksdorfii*, are represented in the United States National Herbarium.

SPECIES EXCLUDED.

Calamagrostis gigantea Nutt., Trans. Am. Phil. Soc. (II) 5: 143 (1837) = *Calamovilfa longifolia* (Hook.) Scribn.

Calamagrostis andina Nutt. Pl. Gamb., Journ. Acad. Phila. (II) 1: 187 (1848), not identifiable from the description, but certainly not a *Calamagrostis*.

Agrostis æquivalvis Trin., referred to *Deyeuxia* by Bentham on account of the minute usually hairy prolongation of its rachilla, is in all other respects an *Agrostis* and should be retained in that genus.

NORTH AMERICAN SPECIES OF CALAMAGROSTIS.

ANALYTICAL KEY TO THE SPECIES.

1. Awn strongly geniculate, exserted, callus hairs shorter than the flowering glume	2
1. Awn straight or nearly so, included, callus hairs not much shorter than the flowering glume	24
2. Awn much exceeding empty glumes	3
2. Awn shorter than or not much exceeding empty glumes	11
3. Panicle loosely flowered, rays spreading	4
3. Panicle densely flowered, rays appressed	8
4. Plants not cespitose	5
4. Plants strongly cespitose	6
5. Tall (5 to 14 dm. high), flowering glume strongly granular-scabrous	1. <i>C. bolanderi</i> .
5. Low (1.5 to 3 dm. high), flowering glume scabrous, but not granular	2. <i>C. deschampsoides</i> .
6. Leaves of innovations short, not nearly equaling the dark purple panicle, plant soft	7

6. Leaves of innovations long, often equaling or surpassing the whitish panicle, plant rather rigid 5. *C. howellii*.

7. Innovations extravaginal, rootstock strong, creeping, spikelets 4 to 5 mm. long 3. *C. lemmoni*.

7. Innovations intravaginal, rootstock none, spikelets 3.5 to 4 mm. long 4. *C. breweri*.

8. Strongly cespitose, rather hard in texture, leaf-blades strongly involute 9

8. Not cespitose, soft in texture, leaf-blades flat 9. *C. tweedyi*.

9. Innovation leaves very long (often surpassing the culm), filiform, not rigid, spikelets 8 to 10 mm. long 6. *C. foliosa*.

9. Innovation leaves short, not filiform, somewhat rigid, spikelets 4 to 8 mm. long. 10

10. Marcescent basal sheaths closely investing culm for $\frac{1}{6}$ to $\frac{1}{3}$ its length, panicle very dense, empty glumes more or less scabrous all over.. 7. *C. purpurascens*.

10. Marcescent basal sheaths much shorter, loose, panicle somewhat interrupted, empty glumes nearly glabrous except on keel 8. *C. vaseyi*.

11. Panicle open, loosely flowered, the rays wide-spreading 12

11. Panicle contracted, usually densely flowered, the rays erect or nearly so..... 13

12. Plant low (1.5 to 3 dm.), soft, panicle dark purple, few-flowered, empty glumes not sharply keeled 2. *C. deschampsoides*.

12. Plant tall, rather hard, panicle pale, empty glumes sharply keeled. 11. *C. aleutica*.

13. Spikelets strongly compressed, empty glumes sharply keeled 14

13. Spikelets not strongly compressed, empty glumes not strongly keeled 19

14. Plant low (not exceeding 5 dm.), leaves short, almost filiform, rigid, erect. Rocky Mountain species..... 10. *C. montanensis*.

14. Tall, leaves longer and wider. Pacific coast species..... 15

15. Panicle narrow and dense, spike-like, leaves all strongly involute..... 16

15. Panicle wider, not spike-like, usually loosely flowered, leaves often flat 11. *C. aleutica*.

16. Plant yellowish, sheaths not bearded at summit..... 17

16. Plant not yellowish, sheaths bearded at summit..... 18

17. Culms and sheaths strongly twisted toward base, panicle oblong-lanceolate, not interrupted, spikelets 5 to 5.5 mm. long 12. *C. villosiformis*.

17. Culms and sheaths not or but slightly twisted, panicle oblong, much interrupted toward base, spikelets 4.5 to 5 mm. long 13. *C. koeleérioides*.

18. Panicle strict, spikelets about 6 mm. long..... 14. *C. angusta*.

18. Panicle usually somewhat flexuous, spikelets 4 to 5 mm. long. 15. *C. subflexuosa*.

19. More or less cespitose, culms usually rather rigid, leaf-blades usually involute. Rocky Mountains and westward 20

19. Not cespitose, culms not rigid, leaf-blades usually flat. Eastern species..... 22

20. Lower leaves in a dense tuft, short, rather rigid, strongly involute, spikelets about 4 mm. long 16. *C. fasciculata*.

20. Lower leaves rarely forming a dense tuft, usually elongated, not rigid..... 21

21. Panicle narrow, spiciform, usually red-purple..... 17. *C. rubescens*.

21. Panicle wider, rarely spiciform, usually pale-green 18. *C. suksdorffii*.

22. Sheaths rarely bearded at summit, panicle more or less tinged with lurid purple, empty glumes rather thick 19. *C. breviseta*.

22. Sheaths usually bearded, panicle not lurid purple, empty glumes thin 23

23. Spikelets 4 to 6 mm. long, callus hairs very sparse, the longer $\frac{1}{2}$ to $\frac{2}{3}$ as long as glume, palea equaling or very nearly equaling glume 20. *C. porteri*.

23. Spikelets 3.5 to 4 mm. long, callus hairs rather copious, the longer about $\frac{3}{4}$ as long as glume, palea considerably shorter than glume..... 21. *C. nemoralis*.

24. Panicle open, the lower rays wide-spreading, leaf-blades flat, callus hairs copious, nearly or quite equaling glume 25

24. Panicle more or less contracted 28

25. Spikelets 4 to 6 mm. long, empty glumes narrow, sharp-acuminate, awn stout, attached below middle, considerably exceeding glume.... 22. *C. langsdorffii*.

25. Spikelets 4 mm. long or less 26
 26. Spikelets 3 to 4 mm. long, panicle usually loosely flowered 27
 26. Spikelets 2 to 2.5 mm. long, panicle rather densely flowered. 25. *C. macouniana*.
 27. Panicle branches conspicuously flexuous, awn attached near apex of glume and
 considerably exceeding it 23. *C. blanda*.
 27. Panicle branches not conspicuously flexuous, awn attached usually near middle,
 equaling or slightly exceeding it 24. *C. canadensis*.
 28. Leaf-blades flat or nearly so, panicle not spiciform 29
 28. Leaf-blades strongly involute 33
 29. Empty glumes not setaceous-pointed, prolongation of rachilla bearded its whole
 length, caryopsis glabrous 30
 29. Empty glumes setaceous-pointed, prolongation of rachilla bearded only near
 summit, caryopsis pubescent especially at summit 30. *C. cinnoides*.
 30. Callus hairs copious, $\frac{2}{3}$ as long to longer than glume 31
 30. Empty glumes narrow lanceolate, callus hairs sparse, $\frac{1}{2}$ as long as glume or less
 32
 31. Not caespitose, longer callus hairs not equaling glume 26. *C. scribneri*.
 31. Strongly caespitose, longer callus hairs considerably exceeding glume
 27. *C. alaskana*.
 32. Tall (9 to 12 dm.), sheaths bearded at summit 28. *C. cusickii*.
 32. Usually low (not exceeding 8 dm.), sheaths not bearded 29. *C. scopulorum*.
 33. Culms and usually almost filiform leaf-blades soft, not rigid, plant not caespitose
 or not strongly so 34
 33. Culms and (usually) wider leaf-blades hard, more or less rigid 36
 34. Panicle dense, narrow, spike-like 35
 34. Panicle loosely flowered, open, flexuous 31. *C. laxiflora*.
 35. Spikelets 2.5 to 4 mm. long, empty glumes thin, acute sharp-acuminate
 32. *C. neglecta*.
 35. Spikelets 2 mm. long, empty glumes thickish, barely acute. 33. *C. micrantha*.
 36. Panicle elongated, not spike-like, rather loosely flowered, plant tall, not caesi-
 tose or but slightly so 37
 36. Panicle usually short, dense, spike-like, plant usually low, strongly caespitose. 38
 37. Ligule 4 to 6 mm. long, hairs of callus about equaling glume. 34. *C. inexpansa*.
 37. Ligule 2 to 3 mm. long, hairs of callus $\frac{1}{2}$ to $\frac{2}{3}$ as long as glume. 35. *C. californica*.
 38. Not exceeding 5 dm. in height, panicle slender, much interrupted toward base,
 awn not nearly equaling glume 36. *C. labradorica*.
 38. Panicle thick, not conspicuously interrupted, awn nearly equaling to slightly
 exceeding the flowering glume 39
 39. Taller (4 to 12 dm.), panicle larger (5 to 20 cm. long), empty glumes merely firm-
 membranous, oblong-lanceolate to ovate-lanceolate, short-acuminate
 37. *C. hyperborea*.
 39. Low (not exceeding 5 dm.), panicle small (4 to 6 cm. long), empty glumes almost
 coriaceous, broad ovate, acute 38. *C. crassiglumis*.

A. Awn strongly geniculate, conspicuously exerted, callus hairs usually much shorter than
 the flowering glume.

a. Awn greatly exceeding the empty glumes.

* Panicle loosely flowered, branches spreading.

† Not caespitose, panicle dark-brown purple.

1. *Calamagrostis bolanderi* Thurb.; S. Wats. Bot. Calif. 2: 280 (1880). *C. varia*
 Boland. in Thurb. l. c., not D. C. *Deyeuxia bolanderi* Scribn., Bull. Torr. Club.
 10: 8 (1883).

Northern California.

Type specimen collected in swamps, Mendocino County, by H. N. Bolander (No.
 6471 in part).

SPECIMENS EXAMINED.—*California*: (Bolander 6471 in part); Mendocino (Pringle), 1892; (Kellogg and Harford 1092), 1868–69.

C. bolanderi is unique in the peculiar granular roughening of its flowering glumes. It has no near relative among the North American species.

2. **Calamagrostis deschampsioides** Trin. Ic. Gram. 3: t. 354 (1836). *C. obtusata* Turez., Bull. Soc. Nat. Mosc. 29: Pt. 1, 26 (1856). *Deyeuxia deschampsioides* Scribn., Bull. Torr. Club 10: 8 (1883).

Bering Sea region.

Type specimen collected in Kamchatka.

SPECIMENS EXAMINED.—*Pribilof Islands*: St. Paul Island (Merriam), 1891; St. Paul Island (Macoun 16224 G. S. C.¹), 1897. *Kamchatka*: Petropaulovski (C. Wright), 1853–56.

†[†] *Strongly cespitose*.

‡ *Plant soft, leaves of innovations short, not nearly equaling the dark purple panicle.*

3. **CALAMAGROSTIS LEMMONI** Kearney, sp. n.²

Plants with slender, creeping rootstocks, numerous, short, erect, or ascending innovations, many slender erect culms 2.5 to 4.5 dm. high, and dark purple panicles. Culms often slightly geniculate, with a few short, loose, thin, marcescent sheaths at base; internodes 2, finally much exceeding their sheaths, the uppermost nearly twice as long as both sheath and blade. Sheaths loosely embracing the culm, thin, glabrous. Ligule 2 to 4 mm. long, thin, whitish, nearly glabrous, lower ones broadly truncate, upper ones narrowed from the base to the acute apex. Blades 2 to 20 cm. long, 1 mm. or less wide, strongly involute, especially toward the setaceous tip, somewhat spreading, flaccid, scabrous on the margins and upper surface. Panicle 4 to 8 cm. long, 1 to 2 cm. wide, oblong-lanceolate, acuminate, contracted, loosely few-flowered, erect, often somewhat flexuous; rachis slender, somewhat flexuous, glabrous or very nearly so, dark purple, its lowest internode 1.5 to 2 cm. long; branches spreading at a small angle (45 degrees or less) to nearly erect, slender, somewhat flexuous, dark purple, glabrous or the upper slightly hispidulous, secondary branches (usually) and shorter primary branches (often) 1-flowered, lower primary branches in 3's to 5's, the longest 2 to 3 cm. long. Spikelets 4 to 5 mm. long. Empty glumes lanceolate to ovate-lanceolate, acute or acutish, not strongly keeled, thin-membranous, dark red-purple, sparsely and minutely scabrous on the keel toward apex or entirely glabrous, equal or the first slightly longer. Flowering glume considerably (often nearly 1 mm.) shorter than the second empty glume (rarely nearly equaling it), oblong-ovate, broadly truncate, thin-membranous, with hyaline edges and tips, somewhat scabrous on the back, the nerves conspicuous, the lateral ones extended into slender, unequal terminal awns 0.3 mm. long or less; awn attached one-sixth

¹ Geological Survey of Canada.

² In the descriptions of the species the following points are to be noted: Length of innovation refers to length of branch and sheathes, excluding the blades. Number of internodes of the culm refers to those of conspicuous length above the base and below the inflorescence. Width of leaf-blade and of the panicle denotes the greatest width. Shape of panicle refers to the outline in the dried plant, fresh material of none of the species having been available. Length of spikelets means length of the longest empty glume, and excludes the awn. The awn is described from dried material, and does not, of course, exhibit exactly the same characters as in the fresh or living state.

In giving the geographical range of the species the typical form alone is included, that of the several varieties being separately stated. Data as to localities, altitude, and latitude are taken for the most part from the collectors' labels, without attempt at verification.

above the base, much exceeding the glume, 5 to 6 mm. long, stout, minutely scabrous, strongly geniculate near the middle, the lower part somewhat twisted, the upper part divergent at an angle of 45 degrees, exserted, straight or slightly flexuous, dark purple. Palea about 1 mm. shorter than the flowering glume, ovate-oblong, truncate, entire or obscurely bidentate, glabrous. Anthers about 2 mm. long. Caryopsis nearly 2 mm. long. Callus hairs sparse, the dorsal ones very short, the lateral ones one-fourth to one-half as long as the flowering glume. Prolongation of the rachilla copiously bearded, with its hairs exceeding the palea and sometimes equaling the flowering glume.

Type specimen in the United States National Herbarium, collected in California by J. G. Lemmon, in 1875.

Intermediate between *C. deschampsioides* and *C. breweri*. From the former it differs in its more cespitose habit, culms taller; ligule usually longer; panicle more contracted; spikelets more numerous and smaller; glumes narrower; flowering glume usually considerably shorter than the empty glumes and conspicuously awn-toothed; awn longer and attached nearer the base, palea shorter, anthers smaller, callus hairs usually shorter, and prolongation of the rachilla longer and with much longer hairs. From *C. breweri* it is distinguished by its creeping root-stock, innovations extravaginal, leaf-blades longer, panicle larger, contracted, with less divergent branches, spikelets larger and more numerous, flowering glume usually considerably shorter than the empty glumes, awn usually longer, and palea considerably shorter than the flowering glume.

4. *Calamagrostis breweri* Thurb.; S. Wats. Bot. Calif. 2: 280 (1880). *Deyeuxia breweri* Vasey Descr. Cat. Grasses U. S. 50 (1885).

Mountains of California.

Type specimen collected near Carsons Pass by W. H. Brewer (2128).

SPECIMENS EXAMINED.—*Sierra Nevada Mountains*: Altitude 2,946 meters (Brewer 2128). *Upper Tuolumne River*: (Bolander 6098), 1867.

A peculiar species, with much the aspect of *Festuca ovina* L., distinguished from all other North American members of the genus by its strictly intravaginal innovations.

†‡ *Plant rather stiff, leaves of innovations long, often equaling or surpassing the whitish panicle.*

5. *Calamagrostis howellii* Vasey; Coul. Bot. Gaz. 6: 271 (1881). *Deyeuxia howellii* Vasey Descr. Cat. Grasses U. S. 51 (1885).

Washington and Oregon.

Type specimen collected in Oregon by T. J. Howell.

SPECIMENS EXAMINED.—*Washington*: Larm River, West Klickitat County (Suksdorf 13), 1883. *Oregon*: Multnomah Falls (Bolander); Columbia River below the Cascades (Howell, 356), 1880; Sandy River (Henderson, 13).

A specimen from Washington, collected by Suksdorf, has the contracted but loosely-flowered panicle of the extreme form of *C. vaseyi*. In habit and other characters, however, it is not distinguishable from *C. howellii*.

** *Panicle densely flowered, branches appressed.*

† *Strongly cespitose, rather hard in texture, leaf-blades strongly involute.*

6. **CALAMAGROSTIS FOLIOSA** Kearney, sp. n. *C. sylvatica longifolia* Vasey Monog. Grasses U. S., Contr. U. S. Herb. 3:83 (1892), not *C. longifolia* Hook.

A somewhat glaucous species with slender rootstocks, numerous short, erect, or ascending innovations whose leaves often equal or surpass the culms, and dense spiciform panicles. Culms 2 to 4.5 dm. high, nearly erect, slender, somewhat flexuous; internodes usually 3, finally greatly exceeding their sheaths. Sheaths closely embracing the culm, slightly scabrous above. Ligule 4 to 5 mm. long, truncate rather firm, whitish, somewhat scabrous. Blades 1 to 3 dm. long, 4

mm. or usually much less in width, strongly involute and usually almost filiform, strongly scabrous on the margins and upper surface, glabrous beneath. Panicle 6 to 10 cm. long, 1 to 2 cm. wide, dense, spike-like, somewhat interrupted toward base, pale, purple, or greenish; rachis slender, somewhat scabrous above, its longest internode 1 to 2 cm. long; branches slender, hispidulous, erect and appressed, the lower primary branches mostly in 5's. Spikelets 8 to 10 mm. long. Empty glumes narrow-lanceolate, gradually attenuate from the base to the sharp-acuminate apex, thin, minutely scabrous, the first slightly longer. Flowering glume about 2 mm. shorter than the first empty one, lanceolate, acutish, minutely scabrous, of about the same texture as the empty glumes, the 4 lateral nerves extended into straight, erect, very slender awns of unequal length, the longest 1 to 2 mm.; dorsal awn attached about one-fifth above the base (but sometimes as high as one-third), 10 to 15 mm. long, slender, bent near the middle, the upper part much exserted and spreading at an angle of about 45 degrees. Palea four-fifths to five-sixths as long as the flowering glume (or occasionally nearly equaling it) considerably narrower, acute, with nerves somewhat excurrent, nearly glabrous. Callus hairs rather sparse, very unequal, the longer ones one-third to one-half (usually one-half) as long as the flowering glume. Prolongation of the rachilla with its rather copious hairs about equaling the palea.

California.

Type specimen in the United States National Herbarium, collected by H. N. Bolander (6470) in the Mattole district, Humboldt County.

C. foliosa is intermediate between *C. howellii* and *C. purpurascens*. From the former, its nearest ally, it differs in its contracted, dense panicle and usually larger spikelets. From *C. purpurascens* it is easily differentiated by its slender, somewhat flexuous culms, very long and almost filiform leaf-blades, considerably larger spikelets, much longer, more slender, less abruptly bent and nearly glabrous awn, prominent aristate teeth to the flowering glume and proportionately longer callus hairs.

7. *Calamagrostis purpurascens* R. Br.; Richards, App. Frankl. Journ., 731 (1823). *Deyeuxia purpurascens* Kunth, Rev. Gram. 1: 77 (1835). *Calamagrostis sylvatica* A. Gray, Proc. Am. Acad. 6: 80 (1866). *Deyeuxia sylvatica* Vasey, Descr. Cat. Grasses U. S., 51 (1885). *Calamagrostis sylvatica americana* Vasey, Monog. Grasses U. S., Contr. Nat. Herb. 3: 83 (1892). *C. sylvatica purpurascens* Thurb.; Vasey, l. c.

East Greenland to Alaska, and southward along the higher mountains to South Dakota, Colorado, and California.

Type specimen collected in the Barren Lands between Point Lake and the Arctic Sea by Dr. Richardson.

SPECIMENS EXAMINED.—*Greenland*: Disco (Warming, Th. Fries, Holm); (Weth-erill 4), 1894. *Arctic coast*: (Richardson, 59, 62, 67, Herb. Hook.). *Rocky Mountains*: Latitude 39 to 41 degrees (Hall and Harbour 624), 1862. *South Dakota*: Black Hills, altitude 1,670 to 1,824 meters (Rydberg 1130), 1892. *Assiniboia*: (Douglas). *Montana*: White Sulphur Springs, Belt Mountains, altitude 2,070 to 2,736 meters (Scribner 362), 1883; Spanish Creek, Gallatin County (Tweedy 1022); Baldy Peak near Bozeman (Rydberg 2224; Shear 468), 1895; Belt Pass (Rydberg 3313½), 1896; Barker, altitude 2,128 meters (Rydberg 3373), 1896; Black Hawk (Rydberg 3296), 1896; Spanish Peaks, altitude 2,432 meters (Rydberg 3074), 1896; Belt Mountains (R. S. Williams 596), 1888. *Wyoming*: Laramie Peak (A. Nelson 1627), 1895. *Colorado*: Denver (Coulter), 1873; (Wolf 398, 587), 1873; Pen Gulch (Vasey); Lake Ranch (G. H. French); Silver Plume, altitude 3,952 meters (Shear 691, 696; Rydberg 2470), 1895; Georgetown, altitude 2,512 meters (M. E. Jones 500), 1878; Georgetown (Shear 614), 1895; Clear Creek (Parry 365, 368), 1861; Pikes Peak (Canby, T. A. Williams 2170, 2188, 2188½), 1896; Manitou, El Paso County, altitude 3,040 meters (Clements 42), 1896; Colorado Mine (Rydberg 2380), 1895; Mount Princeton, altitude 3,344 meters

(Sheldon 607); Beaver Creek, Laramie County, altitude 3,344 meters (Pammel), 1896; Buenavista, Chaffee County, altitude 3,040 to 3,192 meters (Clements 309; Shear 1016), 1896. *Alberta*: Sheep Mountains (Macoun, 13113, G. S. C.); Morley (Macoun), 1885. *Idaho*: (Wheeler Expedition 798, in part), 1871. *Utah*: (Ward) 1875. *Nevada*: Humboldt Mountains, altitude 3,040 meters (Watson 1291). *Alaska*: (McDonald), 1864; along Yukon River (Funston), 1893. *Northwest Territory*: Tagish Lake, latitude 62° (Dawson), 1887; Lewis River (Dawson), 1887; Fort Pelly Banks (Dawson), 1887; Bennetts Lake (Ogilvie), 1887. *British Columbia*: Donald (Macoun), 1885; Kicking Horse Lake (Macoun), 1885; Dease River (Dawson), 1887. *Washington*: Wenatchie region (Tweedy 650), 1883; Mount Stuart, altitude 2,280 to 2,432 meters (Sandberg and Leiberg 825), 1893. *Oregon*: Baker City (Nevius), 1873. *California*: Redwoods (Bolander); Mount Dana, altitude 3,748 meters (Bolander 5071).

C. purpurascens has been confused by some authors with the very distinct *C. sylvatica* (Schrad.) D. C. of Europe, which is a taller, less cæspitose grass with broad, flat, lax, leaf-blades; longer and looser panicle; and broader, less pointed, thinner, and nearly glabrous empty glumes.

CALAMAGROSTIS PURPURASCENS ARCTICA (Vasey) Kearney, n. comb.

C. Arctica Vasey, Ill. N. Am. Grasses 2: Pt. 2, No. 55 (1892).

Depauperate, perfectly smooth and glabrous up to the inflorescence. Culms ascending, 18 cm. or less in length. Leaf-blades short, the longest 7 cm. long, comparatively broad. Panicle 2 to 3 cm. long, barely 1 cm. wide. Spikelets about 5 mm. long. Awn short, about 7 mm. long.

Type specimen in the United States National Herbarium, collected on St. Paul Island, Pribilof Islands, by James M. Macoun (38), July 31, 1891.

8. *Calamagrostis vaseyi* Beal, Grasses N. Am. 2: 344 (1896). *C. purpurascens* Vasey, Monog. Grasses U. S., Contr. U. S. Nat. Herb. 3: 83 (1892), not R. Br.

Mountains of Washington and Oregon.¹

Type specimen collected in the Cascade Mountains, Washington, by G. R. Vasey, in 1889.

SPECIMENS EXAMINED.—*Washington*: Cascade Mountains (G. R. Vasey), 1889; Goat Mountains (O. D. Allen 177), 1896; Skamania County (Suksdorf, 201, 909, 1025), 1886-1890; South Olympia Mountains, altitude 1,368 meters (Henderson 1855), 1890; (Brandegee 177), 1882. *Oregon*: Siskiyou Mountains (Howell), 1887.

Intermediate between *C. purpurascens* and *C. howellii*, the type specimens with shorter awns and denser panicles being nearer the former. From *C. purpurascens* it differs in being very strongly cæspitose from a hard, knotted rootstock, with less rigid and more slender culms; marcescent basal sheaths very short and less closely enveloping the culm; panicle usually looser, fewer flowered, broader, less colored, with longer, straighter, more slender, and less scabrous branches; thinner and smoother, less strongly keeled empty glumes; usually much longer and more slender awn attached higher; and longer callus hairs. From *C. howellii* it differs in its shorter, flatter, and more rigid leaf-blades; and contracted, usually purplish panicle. The spikelets are much like those of the European *C. sylvatica*, but in other respects the plant is quite different.

†† Not cæspitose, soft in texture, leaf-blades flat.

9. *Calamagrostis tweedyi* Scribn.; Vasey, Monog. Grasses U. S., Contr. U. S. Nat. Herb. 3: 83 (1892). *Deyeuxia tweedyi* Scribn., Bull. Torr. Club 10: 64 (1883).

Type specimen collected in the Cascade Mountains, Washington, by Frank Tweedy.

SPECIMENS EXAMINED.—*Washington*: Cascade Mountains (G. R. Vasey), 1889.

A unique species with no near ally.

¹ Northward to Alaska according to Beal, but this is probably a mistake.

b. Awn shorter than or not much exceeding the empty glumes.

* Spikelets strongly compressed, empty glumes sharply keeled.

† Plant low, leaf-blades almost filiform—Rocky Mountain species.

10. *Calamagrostis montanensis* Scribn.; Vasey, Monog. Grasses U. S., Contr. U. S. Nat. Herb. 3: 82 (1892). *Deyeuxia montanensis* Scribn., Proc. Soc. Prom. Agric. (1884) 52 (1885).

Saskatchewan and Alberta to South Dakota and Wyoming.

Type specimen collected on dry "bench lands" east of Helena, Mont., by F. Lamson-Scribner, July 2, 1883.

SPECIMENS EXAMINED.—*Saskatchewan*: (Bourgeau), 1858. *Assiniboia*: Salt Lake (Macoun 101), 18·9; Moose Jaw (Macoun 13102, 13110, G. S. C.), 1896; Chaplin (Macoun 13103, H. G. S. C.), 1896; Cypress Hills (Macoun, 13099, G. S. C.), 1895. *North Dakota*: Billings, Medora County, altitude 668 meters (Brannon 130), 1896. *South Dakota*: Aurora County, altitude 456 meters (Wilcox 744), 1892-93; Ron-dell, common from Aberdeen to Redfield (Griffiths 129), 1896. *Montana*: Sixteen Mile Creek, near Helena, altitude 1,520 meters (Scribner 363), 1883; Grasshopper Valley (Watson 450), 1880; Columbia Falls (R. S. Williams 846), 1894. *Wyoming*: Carbon, altitude 2,064 meters (Britton), 1882; Sheridan County (Buffum, Nelson 5091), 1892. *Alberta*: Pot Hole Creek (Macoun 13098, G. S. C.), 1895; Crow Nest Pass (Dawson 17426), 1883.

The Wyoming specimens have unusually small spikelets (4 mm. long), and in Nelson's plant the palea exceeds the flowering glume by 0.5 mm.

† Plant tall, leaf-blades not filiform—Pacific coast species.

11. *Calamagrostis aleutica* Bong. Veg. Sitcha, Mem. Acad. St. Petersb. (VI) 2: 171 (1832). *Deyeuxia nutkensis* Presl Rel. Haenk. 1: 250 (1828) ?. *Calamagrostis nutkensis* Steud. Syn. Pl. Gram., 190 (1855) ?. *Deyeuxia aleutica* Munro; Hook. f., Trans. Linn. Soc. 23: 345 (1862). *Calamagrostis albicans* Buckl., Proc. Acad. Phila. (1862) 92 (1863). *C. pallida* Nutt., A. Gray, Proc. Acad. Phila. (1862) 334 (1863). *Deyeuxia breviaristata* Vasey, Bull. Torr. Club 15: 48 (1888).

Along the Pacific coast, Unalaska to central California.

Type specimen collected in Unalaska by Chamisso and Eschscholtz.

SPECIMENS EXAMINED.—*Unalaska* (Mertens); (Harrington), 1871-72; (Kellogg 111), 1867. *Alaska*: (Applegate); (Howell); Sitka (Barclay). *British Columbia*: Vancouver Island (J. G. Swan); Barclay Sound, Vancouver Island (Macoun 1734 H. G. S. C.), 1887, type of *Deyeuxia breviaristata* Vasey. *Washington*: (Henderson 2154), 1892. *Oregon*: "Columbia alluvium" (Nuttall), type of *C. albicans* Buckl. and *C. pallida* Nutt.; Waldo (Howell), 1882; (E. Hall 623), 1871. *California*: Oakland, Marin County (Bolander 2274, 6084), 1866; Mendocino (Pringle), 1882; Santa Cruz (Anderson).

CALAMAGROSTIS ALEUTICA PATENS Kearney, var. n.

Culm somewhat geniculate; leaf-blades flat; panicle ovate, about 2 dm. long and 1 dm. wide, open, the branches wide spreading, the primary branches finally horizontal; spikelets about 5 mm. long; awn attached one-sixth to one-fifth above the base of the glume, exceeding the glume by about 1 mm., strongly geniculate, the lower part rather strongly twisted; prolongation of the rachilla with its hairs considerably exceeding those of the palea.

Type specimen in the Gray Herbarium of Harvard University, collected near Mendocino, Cal., probably by H. N. Bolander.

12. *Calamagrostis vilfaformis* Kearney, new name. *C. densa* Vasey; Coult. Bot. Gaz. 16: 147 (1891), not *Deyeuxia densa* Benth. *C. koelerioides densa* Beal Grasses N. Am. 2: 345 (1896).

Southern California.

Type specimen in the United States National Herbarium, collected near Julian, San Diego County, by C. R. Orcutt, in 1889.

SPECIMENS EXAMINED.—Julian, San Diego County (Orcutt), 1889; near Potrero Valley, San Diego County (Orcutt), 1890; Januel Valley, San Diego County (Orcutt), 1890.

The specimens are all immature, with the bases of the panicles still subtended by the uppermost sheaths, and only a few of the spikelets barely in anthesis.

13. **Calamagrostis koelerioides** Vasey; Coul. Bot. Gaz. 16: 147 (1891).

Southern California.

Type specimen in the United States National Herbarium, collected near Julian, San Diego County, by C. R. Orcutt, 1889-90.

Nearly related to *C. villosaformis*, but readily distinguished by its stricter, more slender, and slightly or not at all twisted culms; slightly or not at all twisted sheaths; shorter, narrower, and more strongly involute leaf-blades; smaller, oblong, obtuse, interrupted panicles with shorter branches; somewhat smaller spikelets; broader and less pointed empty glumes; shorter flowering glume; awn attached somewhat higher; hairs of callus somewhat longer, and palea proportionately longer. The specimens are much more mature than those of *C. villosaformis*, yet they exhibit smaller dimensions in almost every part.

14. **CALAMAGROSTIS ANGUSTA** (Vasey) Kearney, sp. n. *C. aleutica angusta* Vasey Monog. Grasses U. S., Contr. U. S. Nat. Herb. 3: 80 (1892).

Rather tall and strict, of hard texture, with strong creeping rootstocks, erect rather long innovations, few culms, and narrow, spike-like, densely flowered panicles. Culms 7 to 11 dm. high, rather slender, erect, and strict (occasionally slightly geniculate below), with a few short, rather loose, marcescent sheaths at base, occasionally slightly twisted below; internodes 4, all but the lowest finally greatly exceeding their sheaths, the uppermost about twice as long. Sheaths rather closely embracing the culms, scabrous, especially toward summit, bearded at junction with the blade (except the uppermost), sometimes very sparsely pubescent toward summit, thickish and rather rigid. Ligule about 4 mm. long, truncate or rounded at the broad apex, thin, minutely scabrous. Blades (of innovations) 5 to 25 (mostly about 15) cm. long, erect, caudine spreading, the uppermost 5 cm. or less long, all 2 to 4 mm. wide, strongly involute at least toward the filiform tip, thickish, usually rather rigid, scabrous on the nerves and margins; minutely pubescent above. Panicle 11 to 17 (mostly 15) cm. long, 1 to 1.5 cm. wide, linear-lanceolate in outline, acuminate, erect, strict, occasionally somewhat interrupted toward base, straw-color, faintly tinged with red purple; rachis scabrous especially toward apex, its lowest internode 2 to 3 cm. long; branches short, appressed, densely flowered, somewhat flexuous, slender, scabrous-pubescent, the lower primary branches mostly in 3's, the longest 2.5 to 5 cm. long. Spikelets nearly 6 mm. long. Empty glumes narrow-lanceolate, sharp-acuminate, rather sharply keeled, minutely scabrous, usually minutely hispidulous on the keel, faintly tinged with purple along the nerves, the first slightly longer. Flowering glume slightly to 1 mm. shorter than the second empty glume, oblong-lanceolate, narrowly truncate, minutely 4-dentate, minutely and densely scabrous on the back; awn attached near the base (one-sixth above or lower), about 3 mm. long, nearly equaling the glume, stout, minutely scabrous, bent somewhat above the middle (sometimes one-third below the apex), the lower part loosely twisted, the upper part divergent at an angle of about 45 degrees, exserted. Palea somewhat exceeding the flowering glume, narrow-lanceolate, narrowed to the obtuse apex, minutely to rather distinctly bidentate, minutely scabrous on the keels. Anthers about 3 mm. long. Callus hairs rather sparse, in two lateral tufts (none dorsal), the longer, two fifths to one-half as long as the flowering glume. Prolongation of the rachilla with its hairs about three-fifths as long as the palea.

Type specimen collected at Santa Cruz, Cal., by Dr. C. L. Anderson, 1891-92.

Differs from *C. aleutica* in its smaller size; more slender habit; culms and sheaths very slightly or not at all twisted; ligule usually longer; sheaths bearded at junction with the blades; blades shorter and much narrower, more strongly involute; panicle narrow, spike-like, densely flowered; spikelets less compressed; empty glumes less strongly keeled and thinner; flowering glume shorter; awn longer and attached lower; callus hairs fewer and altogether lateral, and prolongation of the rachilla with its hairs always exceeding those of the callus.

15. CALAMAGROSTIS SUBFLEXUOSA Kearney, sp. n.

Cæspitose, of rather soft texture, pale but not glaucous, with slender, creeping root-stocks, erect or ascending innovations 1 dm. or less high, rather slender culms very leafy toward base, and narrow, densely flowered panicles. Culms 5 to 10 dm. high, erect, usually slightly compressed toward base, somewhat closely enveloped toward base by the rather long, thin, often somewhat twisted marcescent sheaths; internodes 3 to 4 (usually 4) finally much exceeding their sheaths, the uppermost considerably exceeding both sheath and blade. Sheaths rather loose, the lower ones obscurely pubescent at summit, elsewhere glabrous, or very nearly so. Ligule 2 to 4 mm. long, slightly narrowed to the truncate apex, thin. Blades (lower and of innovations) 1 to 2.5 dm. long; (uppermost), .5 to 1 dm. long, all 2 to 4 mm. wide, strongly involute, slightly scabrous on the margins and nerves, the lower erect, the upper more or less spreading. Panicle 1 to 2 dm. long, 1 to 2 cm. wide, oblong lanceolate, acutish or occasionally acuminate, strongly contracted, almost spiciform, many-flowered, erect, usually somewhat flexuous, often somewhat interrupted, or even slightly lobed, pale brown tinged with pale purple, rachis rather slender, minutely scabrous especially toward apex, its lowest internode 2 to 3.5 cm. long; branches slender, somewhat flexuous, minutely hispidulous, densely flowered, erect or nearly so, the lower primary branches in 4's to 6's, the longest 2.5 to 6 (mostly 5) cm. long. Spikelets 4 to 5 mm. long. Empty glumes lanceolate, acute or short acuminate, rather sharply keeled, firm membranous, minutely scabrous on the keels, elsewhere glabrous, tinged with red-purple, equal or the first slightly longer. Flowering glume, equaling or slightly shorter than the second empty glume, oblong ovate, broadly truncate, minutely to rather conspicuously 4-dentate, thin membranous, rather firm, somewhat scabrous on the back, sometimes tinged with purple; awn attached one-sixth to one-fifth above the base, slightly shorter than to slightly exceeding the glume, stout, minutely scabrous, bent somewhat above the middle, the lower part somewhat twisted, the upper part divergent at an angle of 45 degrees or less, usually somewhat exerted. Palea equaling or slightly exceeding the flowering glume, oblong lanceolate, narrowly truncate, minutely bidentate, thin membranous, minutely scabrous on the keels. Anthers about 2 mm. long. Callus hairs sparse, rather stiff, the longer (lateral) ones two-fifths to three-fifths as long as the flowering glume, dorsal ones much shorter. Prolongation of the rachilla rather sparsely bearded, with its hairs considerably exceeding the longer callus hairs, sometimes only one-fifth shorter than the palea.

Type specimen in the United States National Herbarium collected at Oakland, Cal., by H. N. Bolander (2274).

Apparently intermediate between *C. suksdorffii* and *C. angusta*. From *C. suksdorffii* it differs in its less rigid and wiry culms; long, narrow, dense, not lucid, brownish-purple panicle; strongly keeled empty glumes; flowering glume nearly or quite equaling the empty ones; shorter awn; usually longer callus hairs and larger anthers. From *C. angusta* it is distinguished by its less rigid habit, more flexuous panicle with longer branches, smaller spikelets, less scabrous and usually longer flowering glume, and smaller anthers.

* * Spikelets not strongly compressed, empty glumes not strongly keeled.

+ Cespitose, culms usually somewhat rigid, leaf-blades usually involute—Rocky Mountains and westward.

16. CALAMAGROSTIS FASCICULATA Kearney, sp. n. (Fig. 1.)

Somewhat glaucous, with long, slender, scaly, creeping rootstocks, often with ascending leafy stolons, numerous very short, erect innovations forming a dense tuft, and slender culms very leafy toward base. Culms 6 to 9 dm. long, usually geniculate or even slightly arcuate near base, then erect and rather strict; internodes 3 to 4 (mostly 4), all but the lowest finally exceeding their sheaths, the highest ultimately much more than twice as long as both sheath and blade. Sheaths minutely scabrous, the lower ones bearded at junction with the blade, usually purplish. Ligule 4 to 5 mm. long, pointed, very thin. Blades (of innovations) 10 to 20 (mostly 15) cm. long, 2 to 3 mm. wide; uppermost caudine 4 to 7 cm. long, about 2 mm. wide; all strongly involute, erect, rather rigid, minutely and densely scabrous on the nerves and margins. Panicle 5 to 10 cm. long, about 1 cm. wide, lanceolate, acute, contracted, much interrupted, dull brown tinged with red-purple; rachis slender, minutely scabrous, its lowest internode 5 to 15 mm. long; branches short, appressed, densely flowered, scabrous-pubescent, the lower primary branches in 3's or 5's, the longest about 15 mm. long. Spikelets about 4 mm. long; empty glumes oblong-lanceolate or lanceolate, acutish to sharp-acuminate, thin-membranous, scabrous on the back, especially along the keel, nearly equal or the first somewhat longer. Flowering glume equaling or somewhat shorter than the empty glumes, oblong-ovate, broadly truncate, minutely 4-dentate, thin, scabrous on the back; awn attached about one-fourth above the base, usually conspicuously exceeding the glume (sometimes merely equaling it), stout, bent about one-third below its apex, the lower part twisted, the upper part divergent at an angle of about 45 degrees, exserted, usually dark purple. Palea nearly equaling to slightly exceeding the flowering glume, oblong-lanceolate, narrowly truncate, almost entire or minutely bidentate at apex, minutely roughened and often purplish along the keels. Callus hairs very sparse, mostly lateral, the longer two-fifths to two-thirds as long as the flowering glume. Prolongation of the rachilla sparsely bearded, with its hairs one-sixth to one-third shorter than the palea (or sometimes minute with a few very short hairs).



FIG. 1.—*Calamagrostis fasciculata* Kearney: a, empty glumes; b, floret; c, rudiment or prolongation of rachilla.

California.

Type specimen in the United States National Herbarium, collected on the plains of Mendocino by C. G. Pringle, August, 1882.

SPECIMENS EXAMINED.—Mendocino (Pringle), 1882; Mount Tamalpais, Marin County (Congdon 36a), 1889.

Nearly related to *C. suksdorffii*, differing in its strict habit; innovations forming a close tuft at the base of the culms (which gives the plant a characteristic appearance); leaf-blades rigid and strongly involute; panicle dull brown; empty glumes more scabrous; awn bent nearer its apex; palea equaling or slightly exceeding the flowering glumes; and callus hairs longer.

17. *Calamagrostis rubescens* Buckl., Proc. Phila. Acad. (1862), 92 (1863). *Deyeuxia varia* Scribn., Bull. Torr. Club. 9: 45 (1882), not Kunth. *D. rubescens* Scribn., Bull. Torr. Club. 10: 8 (1883).

British Columbia and Alberta to California.

Type specimen in the herbarium of the Philadelphia Academy of Sciences, collected in Oregon by Nuttall.

SPECIMENS EXAMINED.—*Alberta*: Sheep Mountains, altitude 1,976 meters (Macoun 13113 H. G. S. C.), 1895; Banff (Canby 17), 1895. *British Columbia*: Donald (Macoun 17435 H. G. S. C.), 1885; Deer Park, Lower Arrow Lake (Macoun 17434 H. G. S. C.), 1890; Ainsworth, Kootenai Lake, altitude 848 meters (Macoun 17436 H. G. S. C.), 1890; Kicking Horse Lake, altitude 1,520 meters (Macoun 22), 1890. *Washington*: Cascade Mountains (G. R. Vasey), 1889; (Henderson 2152), 1892. *Oregon*: (Nuttall). *California*: Head waters Sacramento River, altitude 1,520 meters (Pringle), 1881 (not typical); Santa Cruz (Anderson), 1886; Mount Tamalpais (Blankenship 28), 1·91.

Nearly related to *C. suksdorffii* and sometimes rather difficult to distinguish from that species. The long, narrow, spike-like, usually red-purple panicle and usually glabrous or nearly glabrous flowering glume are the most obvious characters. The California specimens with greenish panicles are less typical.

18. *Calamagrostis suksdorffii* Scribn.; Vasey Monog. Grasses U. S., Contr. U. S. Nat. Herb. 3: 82 (1892). *Deyeuxia suksdorffii* Scribn.; Vasey Descri. Cat. Grasses U. S. 51 (1885).

Wyoming and Montana to British Columbia and central California.

Type specimen collected in the canyon of Smith River, Montana, altitude 2,432 meters, by F. Lamson-Scribner in 1883.

SPECIMENS EXAMINED.—*Montana*: Smith River (Scribner 364), 1883; (R. S. Williams 1050), 1894; Glendive (E. A. Ross), 1892; Baldy Peak, Bozeman (Rydberg 2230), 1895; Dry Fork Belt Creek, altitude 1,216 meters (Rydberg 3346, 3359), 1896; Barker, altitude 1,824 meters (Rydberg 3384), 1896. *Wyoming*: Mammoth Hot Springs, Yellowstone Park (Mulford), 1892. *Northwest Territory*: Louis Plain (Macoun 39), 1883. *Idaho*: Lake Pend d'Oreille, Kootenai County (Sandberg 769), 1892; Lake Tesemini, Kootenai County (Sandberg 682), 1892; Beaver Canyon (Rydberg 2325, 2332; Shear 575, 578), 1895; Latah County (Elmer 335). *Alberta*: Banff (Macoun 11455 H. G. S. C.), 1891. *British Columbia*: Ainsworth, Kootenai Lake, altitude 848 meters (Macoun), 1890; Fraser River (Fletcher 52), 1883; Kootenai Pass (Dawson 17438 H. G. S. C.), 1883. *Washington*: Falcon Valley (Suksdorf 26, 607), 1882-1885; Spokane County (Suksdorf 92), 1884; Spokane (Piper 1918), 1894; Pullman (Piper 1919), 1894; Big Klickitat River, Cascade Mountains (Henderson 2150, 2151, 2153, 2155), 1892. *Oregon*: (Howell 195), 1886; Union County (Cusick 1150, 1317), 1884-1886. *California*: (Kellogg and Harford 1089).

CALAMAGROSTIS SUKSDORFFII LUXURIANS Kearney, var. n.

A large form, resembling *C. cusickii* in size and habit. Culms stout, 10 to 13 dm. long, usually of softer texture than in the type; leaf-blades usually laxer and less involute, sometimes flat; panicle large, 1 to 2 dm. long, 2 to 3 cm. wide, oblong-lanceolate, often more loosely flowered than in the type, the longest

primary branch 3 to 7 cm. long; spikelets usually 5 (sometimes only 4) mm. long; flowering glume one-fourth to one-fifth shorter than the shorter empty glume.
British Columbia, Washington, and Idaho.

Type specimen in the United States National Herbarium, collected at Farmington Landing, Lake Cœur d'Alene, Idaho, by Sandberg, Heller, and McDougal (630), 1892.

SPECIMENS EXAMINED.—*Idaho*: Farmington Landing (Sandberg, 630), 1892; Palouse country and Lake Cœur d'Alene (G. B. Aiton 41), 1892; Latah County (Piper 1761), 1893; Cœur d'Alene Mission (Henderson 2832), 1894; Lake Waha, Nez Perces County, altitude 608 to 1,064 meters (Heller), 1896. *British Columbia*: Sicamous (Macoun 37, 17439 H. G. S. C.), 1889; Revelstoke (Macoun 24, 17437 H. G. S. C.), 1890. *Washington*: Cascade Mountains (G. R. Vasey), 1889; (Brandegee 1171), 1883; Peshastin, altitude 608 to 912 meters (Sandberg and Leiberg), 1893.

†*Not cespitose, or but slightly so; culms not rigid, leaf-blades usually nearly flat—Eastern species.*

19. *Calamagrostis breviseta* (A. Gray) Scribn., Mem. Torr. Club 5: 41 (1894). *C. sylvatica breviseta* A. Gray, Man., 582 (1848). *C. pickeringii* A. Gray, Man., ed. 2 547 (1856). *Deyeuxia pickeringii* Vasey, Descr. Cat. Grasses U. S., 51 (1885).

Nova Scotia and Cape Breton to the mountains of New England and northern New York.

Type specimen collected on the alpine tops of the White Mountains, New Hampshire.

SPECIMENS EXAMINED.—*Cape Breton*: Arichat, Isle Madame (J. A. Allen 17), 1882. *Nova Scotia*: Louisbourg (Macoun 41, 17423 H. G. S. C.), 1883. *Vermont*: (Pringle) 1877. *New Hampshire*: White Mountains (Oakes, Tuckerman); Echo Lake, Franconia (Chickering); Mount Monroe (C. E. Faxon 16, 17), 1877; Mount Washington (C. E. Faxon), 1885. *Massachusetts*: Naggett's Pond, Andover (J. Robinson), 1879. *New York*: Avalanche Lake (Torrey ?).

The Cape Breton and Nova Scotia specimens are more leafy and have a narrower, denser, stricter, darker-colored panicle than the White Mountain plant.

CALAMAGROSTIS BREVISETA DEBILIS Kearney, var. n.

Of softer texture; culms sometimes only 2 dm. high, very slender, less rigid, the uppermost internodes much elongated, usually twice as long as both sheath and blade; leaf-blades thinner and rather lax; panicle small (mostly 4 to 10 cm. long, about 1 cm. wide), contracted, almost spiciform, somewhat flexuous; empty glumes narrower and somewhat thinner.

Newfoundland to Massachusetts.

Type specimen in the United States National Herbarium collected on the banks of the Exploits River, near the mouth of Badger Brook, Newfoundland, by B. L. Robinson and H. Schrenk (205), August 13, 1894.

SPECIMENS EXAMINED.—*Newfoundland*: Exploits River (Robinson and Schrenk 205), 1894; Chimney Cove (Waghorne 8), 1895; Grand Lake (Waghorne 41, 42), 1896. *New Hampshire*: Ethans Pond, Mount Willey (Pringle, E. Faxon), 1877-79. *Massachusetts*: Essex County (Conant), 1880.

CALAMAGROSTIS BREVISETA LACUSTRIS Kearney, var. n. *C. lapponica* A. Gray, Proc. Am. Acad., 6: 78 (1862) in part.

Sometimes stoloniferous; rootstock stout; culms usually taller (5 to 10 dm. high); sheaths occasionally somewhat bearded at summit; leaf-blades usually longer and somewhat involute; panicle often longer (maximum length 1.5 dm.); empty glumes usually more scabrous on the keel; flowering glume often somewhat thinner; awn attached one-fourth to one-third above the base; palea noticeably shorter than the flowering glume, almost hyaline; callus-hairs more copious, the longer three-fourths to six-sevenths as long as the flowering glume; prolongation of the rachilla with its hairs slightly shorter than to equaling the flowering glume.

Mountains of New England; near the Great Lakes, Ontario to Minnesota.

Type specimen in the United States National Herbarium collected at Fond du Lac, Minn., by F. F. Wood, July 23, 1889.

SPECIMENS EXAMINED.—*New Hampshire*: Mount Willard (C. E. Faxon 9), 1875. *Vermont*: Mount Mansfield (Pringle), 1876. *Ontario*: Flat Rock Portage, Lake Nipigon (Macoun 54, 17392 H. G. S. C.), 1884. *New York*: Racket Lake (Leggett), 1857. *Michigan*: Isle Royale (Porter), 1865. *Minnesota*: Fond du Lac (F. F. Wood), 1889; Gunflint Lake (F. F. Wood), 1891.

The specimens from the region of the Great Lakes are mostly very distinct, having taller culms, longer leaves, and longer, narrower, denser panicles than typical *C. breviseta*. Were it not for the occurrence of a few intergrading forms they would be regarded as representing a perfectly distinct species. The specimen from Gunflint Lake and that from Mount Willard, however, agree in habit, aspect, and size with *C. breviseta*, differing only in the floral characters above enumerated. The plant from Lake Nipigon has the panicle of the Nova Scotia specimens of *C. breviseta*, but its floral characters refer it to the variety.

20. *Calamagrostis porteri* A. Gray, Proc. Am. Acad. 6: 79 (1862). *Deyeuxia porteri* Vasey, Descr. Cat. Grasses U. S., 51 (1885).

New York and Pennsylvania.

Type specimen collected at Pulpit Rocks, Huntingdon County, Pa., by T. C. Porter, in August, 1862.

SPECIMENS EXAMINED.—*New York*: Sullivan Hill, Chemung County (T. F. Lucy 1185), 1895. *Pennsylvania*: Alexandria, Barre Station, Warriors Ridge, Pulpit Rocks, and Porter Township, Huntingdon County (Porter), 1862–1882.

21. ***CALAMAGROSTIS NEMORALIS*** Kearney, sp. n. *C. porteri* Vasey: Dudley Cayuga Fl. 125 (1886), not A. Gray.

Slightly glaucous, apparently not cespitose, of soft texture, with slender, creeping rootstocks, tall (2.5 to 4 dm.) erect innovations, and densely flowered, pale-colored panicles. Culms 10 to 15 dm. high, erect, rather slender, rather closely invested by a few long thin marcescent sheaths at base; internodes 5, all but the lowest finally considerably exceeding their sheaths, the uppermost nearly as long as both sheath and blade. Sheaths closely embracing the culm to their summits, rather firm, usually bearded at junction with the blade with short white tomentose pubescence, rather strongly scabrous on the edges, elsewhere glabrous, or nearly so. Ligule 3 to 5 mm. long, truncate, thin, rather strongly scabrous on the back. Blades (lower and of innovations) 2 to 3.5 dm. long (uppermost), 1 to 1.5 dm. long (all), 3 to 6 mm. wide, flat, rather thin, minutely but strongly scabrous on the margins and both surfaces, somewhat glaucous above, bright green beneath, lax, the lower erect, the upper spreading, the uppermost horizontal or even somewhat reflexed. Panicle 1 to 1.5 dm. long, 1.5 to 2.5 cm. wide, oblong-lanceolate, sharp-acuminate, contracted, erect, slightly flexuous; rachis rather slender, somewhat flexuous, hispidulous above, nearly glabrous toward base, its lowest internode 1.5 to 2 cm. long; branches slender, slightly flexuous, hispidulous, densely flowered, nearly erect, or the lower somewhat spreading, lower primary branches in 5's, the longest 3 to 5 cm. long. Spikelets 3.5 to 4 mm. long. Empty glumes lanceolate or oblong lanceolate, acuminate, rounded on the back or rather strongly keeled, hispidulous on the keels, elsewhere glabrous, the first slightly longer. Flowering glume, usually about equaling the second empty glume, ovate oblong, obscurely 4-dentate or almost entire, thin but rather firm, scabrous-punctate on the back; awn attached about one-fifth above the base, slightly exceeding the glume, stout, minutely scabrous, bent near the middle, the lower part somewhat twisted, the upper part divergent at a small angle and slightly exserted. Palea about three-fourths (sometimes four-fifths) as long as the flowering glume, ovate-oblong, denticulate (occasionally slightly bidentate), glabrous. Callus hairs not copious, rather stiff, bright white, the

longer usually one-fourth shorter than (sometimes nearly equaling) the flowering glume. Prolongation of the rachilla, with its sparse hairs not equaling or barely equaling the longer hairs of the callus.

Maine; western New York.

Type specimen in the United States National Herbarium, collected on high ground, in woods of pine, rock-oak, hickory, etc., on Thacher's Pinnacle, Danby, near Ithaca, N. Y., by W. R. Dudley, August 1, 1884.

SPECIMENS EXAMINED.—*Maine*: Wet cliffs, Boarstone Mountain, Elliottsville, Piscataquis County; altitude 547 meters (Fernald 427), 1895. *New York*: Thachers Pinnacle (Dudley, Coville), 1884–1888.

Intermediate between *C. canadensis* and *C. porteri*. From the former it differs in its sheaths usually bearded at junction with the blade; contracted and dense panicle; stouter, bent and exserted awn; longer palea; less copious, shorter, stiffer callus hairs; and shorter hairs to the prolongation of the rachilla. From *C. porteri* it is distinguished by its laxer habit; more slender culms; usually denser panicle; smaller spikelets; smoother and thinner empty glumes; less scabrous and thinner flowering glume; shorter awn, flexuous or but slightly twisted below; shorter palea; and longer more copious callus hairs. Indicated by Dudley in the United States National Herbarium as a variety of *C. canadensis*.

B. Awn straight or nearly so, included, callus-hairs usually not much shorter than the flowering glume.

a. Panicle open, the lower rays wide-spreading, leaf-blades flat or nearly so, callus-hairs copious, nealy or quite equaling the glume.

22. *Calamagrostis langsdorffii* Trin. Gram. Unifl., 225, t. 4, f. 10 (1824). *Arundo langsdorffii* Trin. l. e., not Link. ? *Calamagrostis scabra* Presl. Rel. Haenk. 1: 234 (1828) ? *C. hirtigluma* Steud. Syn. Pl. Gram. 188 (1855). *C. oregonensis* Buckl., Proc. Acad. Phila. (1862) 92 (1863). *C. columbiensis* Nutt.; A. Gray, Proc. Acad. Phila. (1862) 334 (1863). *Deyeuxia halleriana* Vasey Descr. Cat. Grasses U. S. 50 (1865), not *C. halleriana* DC.

Greenland to Alaska, south in the mountains to North Carolina, Michigan, New Mexico, and California; northern Europe and northern Asia.

Type specimen collected at Tobolsk, Siberia.

SPECIMENS EXAMINED.—*Greenland*: Godthaab, (Meehan 75), 1892. *Labrador*: Ungava Bay, (Turner 670); Ungava Bay, (Spreadborough 13197 G. S. C.), 1896; Venison Tickle, (Waghorne 13352 G. S. C.), 1891; Chateau, (J. A. Allen 20), 1882; Independent, (Waghorne 50), 1892; Turners Head, Hamilton Inlet, (Waghorne 52), 1892; Hamilton River, (Low 6082 H. G. S. C.), 1894. *Newfoundland*: St. Johns, (Robinson and Schrenk 204), 1894; Shoal Point, (Waghorne), 1895. *Nova Scotia*: Magdelan Islands (McKay 17381 H. G. S. C.), 1878. *Cape Breton*: Whycocomah, (Macoun 17380 H. G. S. C.), 1883. *New Brunswick*: Restigouche River, (Brittain 17383 H. G. S. C.), 1888. *Quebec*: Grand Etang, Gaspe, (Macoun 26, 17377 H. G. S. C.), 1882; Mount Albert, (Macoun 17378 H. G. S. C.), 1882; Table Topped Mountain, Gaspe, altitude 912 meters, (J. A. Allen), 1887. *Maine*: Northeast Harbor, Mount Desert, (T. G. White), 1891; Mount Saddleback, Franklin County, altitude 1,064 meters. (Fernald), 1894. *New Hampshire*: Mount Willey, Ethans Pond, (C. E. Faxon), 1877; White Mountains, (Nuttall, Oakes, Tuckerman); Mount Washington, (W. Boott, Pringle, Garber, Allen), 1855–1878. *Vermont*: Mount Mansfield, (Pringle) 1876; Willoughby, (Rusby), 1892. *New York*: Mount Mackay, (Britton), 1889; Mount McIntyre, altitude, 1,426 meters, (Britton), 1892; Mount Marcy, altitude 1,368 meters, (Britton), 1892. *North Carolina*: Roane Mountain, (Curtis). *Northeast Territory*: Lake Mistassini, (J. M. Macoun 17361 H. G. S. C.), 1885; Fort George, James Bay, (J. M. Macoun 17382), 1887. *Ontario*: Thunder Bay, Lake Superior, (Macoun 160, 17384 H. G. S. C.), 1869. *Michigan*: Isle Royale, (Porter), 1865. *Saskatchewan*: Saskatchewan River, (Douglas). *Assiniboina*: Bear Lake, (Douglas) 120. *Colorado*: Clear Lake, Georgetown,

(Patterson), 1885; Georgetown, (Shear 615), 1895; Robinson, Summit County, altitude 3,344 meters, (Shear 1061), 1896. *New Mexico*: Santa Fe. (Fendler 969) 1847. *Northwest Territory*: Lewis River, (Dawson 17357 H. G. S. C.), 1887; Fort Good Hope, Mackenzie River, (E. Taylor 17364 H. G. S. C.), 1892; Black River, east of Lake Athabasca, (Tyrrell 17390, 17421 H. G. S. C.), 1893. *Idaho*: St. Maries River, Kootenai County, (Henderson 2830), 1894. *Utah*: (Ward), 1875. *Alaska*: Unalaska, (Harrington), 1871-72; Kadiak Island, (Kellogg 110); (Dall 1873); Sitka, (F. Bischoff), 1865-66; (W. G. Wright 1588, 1589), 1891; Saint Michaels, (Turner 7), 1879; Lake Lindeman, head Yukon River, (Schwatka 12, 77), 1883; (Funston 136), 1891; along Yukon River, (Funston 131, 159), 1892-93; 93; Yes Bay, (Howell 174), 1895; (Seeman 1764), 1851. *British Columbia*: Fort Vancouver, (Garry 441), 1826; (Rothrock), 1865-66; Selkirk Mountains, (Macoun 17347 H. G. S. C.), 1885; Shawnegan Lake, Vancouver Island, (Macoun 17379 H. G. S. C.); Dicks Lake, Sooke, Vancouver Island, (Macoun 156), 1893; MacLeods Lake, (Macoun 17386 H. G. S. C.), 1885; Griffin Lake, altitude 1,824 meters, (Macoun 17362 H. G. S. C.); Queen Charlottes Islands, (Dawson 17387 H. G. S. C.), 1878; Upper Nechoaco River, (Dawson 17388 H. G. S. C.), 1876; Fort Simpson, (McEvoy 17391 H. G. S. C.), 1893. *Washington*: Mount Adams (Howell), 1882; Mount Adams, (Suksdorf 87, 204), 1884-1886; Mount Rainier, (E. C. Smith 981), 1890; Cascade Mountains, (G. R. Vasey), 1889; Laks Kichelas, Cascade Mountains, Kittitas County, (Henderson 2157), 1892; Cascade Mountains, altitude, 1,824 meters, (Sandberg and Leiberg 795), 1893; Totoish Mountains, altitude 1,520 meters, (O. D. Allen), 1896. *Oregon*: Columbia River, (Nuttall), type of *C. columbiensis* Nutt. and *C. oregonensis* Buckl.; Rooster Rock, Multnomah County, (Suksdorf 144), 1885; Union County, altitude 1,824 meters, (Cusick 794), 1881. *California*: Sierra Nevada Mountains, (Hillebrand 8), 1863; Yosemite Valley, altitude 3,344 meters, (Bolander 6087, 6088), 1881.

CALAMAGROSTIS LANGSDORFFII LACTEA (Beal) Kearney, n. comb.
Calamagrostis lactea Beal Grasses N. Am. **2**: 346 (1896). *Deyeuxia lactea* Suksdorf; Beal Grasses N. Am. **2**: 346 (1896).

Panicle whitish or pale green, usually tinged with pale purple, somewhat more open and flexuous; palea more than two-thirds as long as the flowering glume; callus-hairs one-sixth to one-third (usually one-fifth) shorter than the flowering glume. Washington.

Type specimen collected on the banks of the North Fork of the Nooksak River near Mount Baker by W. N. Suksdorf (1022), 1890.

SPECIMENS EXAMINED: Falcon Valley, 1886, (Suksdorf 206); near Mount Baker (Suksdorf 1022), 1890.

23. **Calamagrostis blanda** Beal Grasses N. Am. **2**: 349 (1896). *C. pallida* Vasey and Scribn.; Vasey Monog. Grasses U. S., Contr. U. S. Nat. Herb. **3**: 79 (1892), not *C. Muell.*

Montana and Washington.

Type specimen collected on the wet shady banks of the Klickitat River, West Klickitat County, Wash., by W. N. Suksdorf (52), July 21, 1883.

SPECIMENS EXAMINED.—*Montana*: Helena, (Rydberg 2139 $\frac{1}{2}$), 1895; Castle, (Rydberg 3238), 1896. *Washington*: (Suksdorf 52), 1883.

Nearly related to *C. canadensis*, but distinguished by its pale, whitish panicle with usually very flexuous branches, narrower and sharper pointed empty glumes, and awn attached near the apex and usually considerably longer than the flowering glume.

24. **Calamagrostis canadensis** (Michx.) Beauv. Agrost. 157 (1812). *Arundo canadensis* Michx. Fl. Bor. Am. **1**: 73 (1803). *Agrostis mexicana* Pers. Syn. **1**: 76 (1805)? *Arundo agrostoides* Pursh Fl. Am. Sept. 86 (1814). *Calamagrostis mexicana* Nutt. Gen. **1**: 46 (1818). *C. agrostoides* Trin. Gram. Unifl. 228 (1824). *Cinna? purshii* Kunth Enum. **1**: 208 (1833). *Arundo fissa* Willd.; Steud. Nom. Ed. 2, **1**: 144

(1840). *Deyeuxia canadensis* Munro; Hook. f., Trans. Linn. Soc. **23**: 345 (1862).
Calamagrostis michauxii Trin.; Steud. Nom. Ed. 2, **1**: 250 (1840).

Prince Edward Island to British Columbia, south to New Jersey, Ohio, Iowa, Utah, and Oregon.

Type specimen collected in Canada by Michaux.

SPECIMENS EXAMINED.—*Prince Edward Island*: Brackley Point, (Macoun 17343 H. G. S. C.), 1888. *New Brunswick*: Campbellton, (Chalmers 17342 H. G. S. C.), 1877; Digdequash, Charlotte County, (Hay 17349 H. G. S. C.), 1883. *Quebec*: Gaspé, (Macoun 42), 1882; Salt Lake, Anticosti Island, (Macoun 17348 H. G. S. C.), 1883; Notre Dame du Lac, Temiscouata, (Northrop 205), 1887; Granby, (W. Scott 17342 H. G. S. C.), 1892; Damville, (Berg), 1894. *Ontario*: Long Point, Lake Erie, (Macoun 17351 H. G. S. C.); shore Lake Huron, (Macoun 25), 1871; Flat Rock Portage, Nipigon River, (Macoun 17360 H. G. S. C.), 1884; Port Arthur, (Britton), 1889; (J. White 17350 H. G. S. C.), 1890; Billings Bridge, Rideau River, (Macoun 7485 H. G. S. C.), 1894; Kingston, (Fowler), 1895; Humber Valley, Toronto, (W. Scott 13096 H. G. S. C.), 1896. *Maine*: Mount Desert Island, (Redfield), 1889; Van Buren, Aroostook County, (Fernald 181), 1893; Cape Elizabeth, (Scribner, Gayle), 1895; East Auburn, (Merrill), 1896. *New Hampshire*: Hampton, (Flint); Jaffrey, (Robinson 330, 333), 1897; Crawfords, White Mountains, (Churchill), 1895. *Vermont*: Smugglers Notch, (C. E. Faxon), 1897. *Massachusetts*: Ipswich, (Oakes); Revere, (H. A. Young), 1879. *Rhode Island*: (Olney). *Connecticut*: Huntingdon, (Eames), 1895. *New York*: Oxford, (Coville), 1884; Schenectady, (Wibbe), 1884; New Dorp, Staten Island, (Britton), 1890; Clear Lake, Adirondack Lodge, (Britton), 1892; Avalanche Lake, Adirondacks, (Mrs. S. B. Clarke), 1894. *New Jersey*: Clifton, (Nash), 1892; Stockholm, altitude 334 meters, (Van Sickles), 1895. *Pennsylvania*: Harrisburg, (Small), 1888. *Ohio*: Columbus, (Sullivant), 1840; (Bolander). *Michigan*: Clifton, Keweenaw County, (Farwell 527), 1887. *Wisconsin*: (Lapham); (S. H. Watson); Brown County, (Schuette), 1886; Door County, (Schuette), 1887; Wisconsin River near Knowlton, (Cheney 3345), 1895; Hurley, (Random), 1896. *Illinois*: Hyde Park, (Babcock), 1873. *Minnesota*: Duluth, (Vasey), 1887; (Sandberg 297), 1891. *Iowa*: Emmett County, (Cratty), 1889; Fayette County, (Fink 620), 1894; Marshalltown, (Eckles), 1896; Ames, (C. R. Ball 59, 133), 1896. *Manitoba*: Lake Winnipeg, (Houghton 16), 1832; Brandon, (Macoun 13092 H. G. S. C.), 1896. *North Dakota*: Churchs Ferry, Ramsey County, (Brannon 63), 1896. *South Dakota*: Custer and Hot Springs, Black Hills, altitude 1,064 to 1,520 meters, (Rydberg 1127, 1128), 1892. *Nebraska*: Whitman, Grant County, (Rydberg 1620), 1893; Aten, Cedar County, (Clements 2670), 1893. *Northwest Territory*: Cumberland House, (Richardson 37); Great Slave Lake, (E. Taylor), 1892. *Saskatchewan*: (Bourgeau), 1858; Prince Albert, (Macoun 13091, 13114 H. G. S. C.), 1896. *Montana*: (Scribner 359), 1883; Gallatin County, (Tweedy 1023), 1886; Columbia Falls, (R. S. Williams 598), 1894; Manhattan, (Shear 417), 1895; Madison River, (Shear 519, Rydberg 2278), 1895; East Gallatin Swamp, altitude 1,520 meters, (Rydberg 3203), 1896. *Wyoming*: Yellowstone Park, (Tweedy 584), 1885; Albany County, (Buffum 6), 1891. *Colorado*: Eagle River, (Coulter), 1873; (Vasey), 1888; Idaho Springs, (Shear 728), 1895. *Alberta*: Waterton Lake, Rock Mountains, (Macoun 13090 H. G. S. C.), 1895. *Utah*: Wahsatch Mountains, altitude 2,432 meters, (M. E. Jones 1274), 1879. *British Columbia*: Revelstoke, (Macoun), 1890: MacLeods Lake, (Macoun 17346 H. G. S. C.), 1895; Alberni Canal, Vancouver Island, (Macoun 17336 H. G. S. C.), 1887. *Washington*: Spokane County, (Suksdorf 86, 90a), 1884; (Henderson 2162), 1892; Wenatchie region, (Brandegee 1169). *Oregon*: Union County, (Cusick 1039).

Calamagrostis canadensis 'acuminata' Vasey, Bull. U. S. Div. Agrost. **5**: 26 (1897);
C. canadensis robusta Vasey in Rothr.; Wheeler Rep. **6**: 285 (1878), not *C. robusta*
 C. Muell.

Sheaths rarely inconspicuously bearded at junction with the blade; blade usually short scabrous-pubescent on the upper (rarely both) surfaces; panicle commonly rather small, more flexuous, more densely flowered, usually dark purple; spikelets larger (3.5 to 4 mm. long); empty glumes comparatively narrower, sharp attenuate-acuminate, sometimes subfalcate, somewhat thicker, usually much more scabrous (occasionally almost strigose); awn longer, often considerably (sometimes 0.5 mm.) exceeding the flowering glume.

This variety represents a transition from *C. canadensis* to *C. langsdorffii*. The extreme form can be distinguished from the latter species only by its smaller spikelets and usually shorter awn and less scabrous empty glumes. It is most abundant in the Rocky Mountain region, where it largely replaces the typical forms of both the related species.

Labrador and Newfoundland; high mountains of North Carolina; Keewatin to Alaska, south in the mountains to New Mexico and California.

Type specimen collected in California by H. N. Bolander (6087), 1866.

SPECIMENS EXAMINED.—*Labrador*: Esquimaux River, (J. A. Allen 19), 1882. *Newfoundland*: (Waghorne 31), 1896. *North Carolina*: Roan Mountain, (Scribner), 1889. *Keewatin*: Severn River, (J. M. Macoun 17352 H. G. S. C.), 1886. *Athabasca*: (Macoun 116), 1872. *Assiniboina*: Moose Jaw, (Macoun 56), 1880. *Montana*: Deep Creek, altitude 1,368 meters, (Scribner 358), 1883; Beaver Creek, (Scribner 226), 1883; Lima, (Shear 553), 1895; Manhattan, (Shear 419, 424), 1895; Manhattan, (Rydberg 2189), 1895; Helena, (Rydberg 2139½), 1895; East Gallatin swamps, altitude 1,520 meters, (Rydberg 3202), 1896; Castle, (Rydberg 3235), 1896; Yogo Gulch, altitude 1,520 meters, (Rydberg 3408), 1896; Bridger Canyon, altitude 1,672 meters, (Rydberg 3205), 1896; Spanish Creek, altitude 1,824 meters, (Rydberg 3016, 3024, 3049, 3073), 1896; Barker, altitude 1,520 meters, (Rydberg 3365, 3366), 1896; Dry Fork Belt Creek, altitude 1,216 meters, (Rydberg 3358), 1896; Belt Pass, altitude 1,976 meters, (Rydberg 3333), 1896; Spanish Creek, (T. A. Williams 2027), 1896; Spanish Creek Basin, altitude 2,432 meters, (T. A. Williams 2057½), 1896. *Yellowstone National Park*: Pelican Creek, (Tweedy 584), 1885; Yellowstone River Upper Falls, (Hayden 77), 1871; (Letterman 46), 1885; Mammoth Hot Springs, altitude 1,884 meters, (Burglehaus), 1893. *Wyoming*: Lincoln Gulch, (Nelson 2625), 1896; (Parry 300), 1873. *Colorado*: Twin Lakes, Eagle River, (Coulter), 1873; Twin Lakes, (Wolf 1093), 1873, (type of *C. canadensis robusta* Vasey); Golden City, (Greene), 1871; La Plata Mountains, (Eastwood 13), 1891; Steamboat Springs, Routt County, (Eastwood 21), 1891; Clear Lake, Georgetown, (Rydberg 2375), 1895; Georgetown, altitude 2,888 meters, (Patterson 31), 1885; Georgetown, (Shear 611), 1895; Idaho Springs, (Shear 721), 1895; Buena-vista, Chaffee County, altitude 3,040 meters, (Shear 1004, 1019), 1896; Veta Pass, Costilla County, altitude 2,860 meters, (Shear 337), 1896; Villa Grove, Saguache County, altitude 2,736 meters, (Shear 888, Clements 125), 1896; Marshall Pass, Saguache County, altitude 3,280 meters, (Shear 903, Clements 225), 1896; Breckenridge, Summit County, altitude 2,888 meters, (Shear 1075), 1896; Ruxton Creek, Pikes Peak (Clements 12), 1896; Pikes Peak (T. A. Williams 2178, 2181; Shear 722), 1896. *New Mexico*: Santa Fe Creek, (Fendler 957), 1847. *Northwest Territory*: Mackenzie River, (McConnell 17359 H. G. S. C.), 1888. *Idaho*: Henrys Fork, (Hayden), 1872; Lake Tesemini, Kootenai County, (Sandberg 694), 1892; Cœur d'Alene River, Kootenai County, (Sandberg 637), 1892; Lake Cœur d'Alene, (Sandberg 561, 578), 1892; Palouse Country and Lake Cœur d'Alene, (G. B. Aiton 37), 1892; Grangeville, Camas Prairie, (Henderson 2831), 1894; Beaver Canyon, (Rydberg 2328), 1895; Petit Lake, (Evermann 314), 1895; Redfish Lake, altitude 2,128 meters, (Evermann 427), 1895. *Utah*: Southern Utah, (Palmer 482), 1877. *Arizona*: Rincon Mountains, altitude 2,280 meters, (Nealley 70), 1891. *Alaska*: Yukon River, (Kennicott). *British Columbia*: Fraser River, (Lyall), 1859; Donald, Columbia Valley, (Macoun 53, 17353 H. G. S. C.), 1895; Adams Lake, altitude 1,700 meters, (Dawson 17344 H. G. S. C.), 1888; Vancouver Island,

(Macoun 124), 1887; Griffin Lake, (Macoun 35), 1889; Kamloops, (Macoun 17354 H. G. S. C.), 1889; Revelstoke, (Macoun 17356 H. G. S. C.), 1890; Comox, Vancouver Island, (Macoun 155 H. G. S. C.), 1893. *Washington*: Cascade Mountains, (Brandegee 1168), 1883; Cascade Mountains, (G. R. Vasey), 1889; Cascade Mountains, (Lyall), 1860; Spokane County, (Suksdorf 89), 1884; Falcon Valley, (Suksdorf 207), 1886; West Klickitat County, (Suksdorf 142, 208, 2127), 1885-1892; Skamania County, (Suksdorf 203, 205), 1886; North Fork Nooksak River, near Mount Baker, (Suksdorf 2166), 1890; Mount Adams, (Howell 82, Suksdorf 209). *Oregon*: Sauvie's Island, (Howell), 1883; Hood River, (Howell 194), 1886; Rogue River Valley, (Howell), 1887; Crater Lake, altitude 1,870 meters, (Coville and Leiberg 412), 1896. *California*: (Bolander 818, 6087, 6088), 1866; Merced River, (Bolander), 1866; Calaveras County, (Hillebrand 2244, 2245); Donner Lake, Sierra Nevada Mountains, (Torrey 559), 1865; Merced River, (Torrey 559c), 1865.

CALAMAGROSTIS CANADENSIS CAMPESTRIS Kearney, var. n.

Low (not exceeding 5.5 dm.); leaf-blades erect, rather firm, somewhat involute, the largest 12 cm. long and 2 mm. wide; panicles small, the largest 9 cm. long and 3 cm. wide, densely flowered, somewhat flexuous, straw-color, tinged with pale purple, the branches somewhat spreading or nearly erect, the longest 4 cm. long; spikelets 3.5 mm. long; empty glumes acuminate, hispidulous on the keel, elsewhere minutely scabrous; palea about one-fifth shorter than the flowering glume; callus-hairs copious, about equaling the palea.

Type specimen in the United States National Herbarium, collected on the borders of marshes on the open prairie, Louis Plain, Assiniboia, by J. M. Macoun (56, 17418 H. G. S. C.), July, 1883.

25. *Calamagrostis macouniana* Vasey, Monog. Grasses. U. S., Contr. U. S. Nat. Herb. 3: 81 (1892). *Deyeuxia macouniana* Vasey; Coulter. Bot. Gaz. 10: 297 (1895).

Assiniboia to Missouri, Montana, and Washington.

Type specimen in the United States National Herbarium, collected on the borders of marshes, Louis Plain, Assiniboia, by J. M. Macoun (44), 1883.

SPECIMENS EXAMINED.—*Missouri*: Little Blue, Jackson County, (Bush. 386), 1896.

Manitoba: Black River, Lake Winnipeg, (J. M. Macoun 17394 H. G. S. C.), 1884.

South Dakota: Chamberlain, (E. N. Wilcox 6), 1892. *Assiniboia*: Louis Plain, (Macoun 44, 45, 17393 H. G. S. C.). *Montana*: Manhattan (Rydberg 2191½; Shear 422). *Washington*: Spokane County, (Suksdorf 1097), 1889.

Distinguished from *C. canadensis* by its usually stricter habit, smaller, more contracted, and denser panicles and small spikelets. The Missouri plant approaches *C. canadensis* in its somewhat larger spikelets, looser panicles, and laxer habit.

b. Panicle more or less contracted.

*Leaf-blades flat or nearly so, panicle not spiciform.

†Prolongation of rachilla bearded its whole length, caryopsis glabrous.

‡Callus-hairs copious, two-thirds as long as to longer than the flowering glume.

26. *Calamagrostis scribneri* Beal, Grasses N. Am., 2: 343 (1896). *Deyeuxia dubia* Scribn.; Coulter. Bot. Gaz. 11: 70 (1886). *Calamagrostis dubia* Scribn.; Vasey, Monog. Grasses U. S., Contr. U. S. Nat. Herb., 3: 80 (1892). *C. canadensis dubia* Vasey, l. c.

Montana and Yellowstone Park to British Columbia and Washington.

Type specimen collected along Slough Creek, Yellowstone Park, altitude 2,034 meters, by F. Tweedy (585), 1885.

SPECIMENS EXAMINED.—*Montana*: Belt Mountains, (R. S. Williams 551), 1886; Fort Logan, altitude 1,520 meters, (Scribner 365), 1883; (Knowlton) 1887; Spanish Creek, altitude 1,824 meters, (Rydberg 3083, 3096, 3100; T. A. Williams 2009), 1896; East Gallatin Swamps, altitude 1,520 meters, (Rydberg 3203), 1896; Spanish Creek Basin, altitude 2,432 meters, (T. A. Williams 2057), 1896. *Wyoming*: Yellowstone Park, (Tweedy 585), 1885. *Colorado*: (Wolf 664) 1873; (Letterman 44, 45), 1885. *Alberta*: Devils Head Lake near Banff, altitude 1,426 meters, (Macoun 23),

1891. *British Columbia*: Kicking Horse Lake, altitude 1,520 meters, (Macoun 20b), 1890. *Washington*: Mount Adams, altitude 1,520 to 1,824 meters, (Suksdorf 145), 1885; Chiquash Mountains, Skamania County, (Suksdorf 1023), 1890.

Related to *C. canadensis* and *C. langsdorffii*, differing from both in its stricter habit, culms rarely branching from the upper nodes, sheaths almost always bearded at junction with the blade, upper leaf surface usually conspicuously glaucous, panicle narrow, contracted, with shorter, more nearly erect branches, callus hairs shorter, and palea longer. From *C. canadensis* it is also distinguished by its longer and stouter awn, and from *C. langsdorffii* by its paler color, merely scabrous leaf-blades, straight or but slightly flexuous panicle and less scabrous and thinner empty glumes. Forms intergrading with *C. canadensis acuminata* occur, but the species is, on the whole, well marked. The type specimen represents the extreme and most distinct form.

27. CALAMAGROSTIS ALASKANA Kearney, sp. n.

A strongly cespitose plant of rather soft texture, with numerous somewhat elongated (often 1.5 dm.) erect innovations and tall culms from strong creeping rootstocks. Culms 10 to 12 dm. high, erect but not strict, rather slender, rather closely enveloped at base by numerous thin marcescent sheaths; internodes 4, the lowest very short, the others elongated and finally considerably exceeding their sheaths, the uppermost exceeding both sheath and blade. Sheaths closely embracing the culm nearly to their summit, usually somewhat twisted about the culm, thin, glabrous, except the minutely scabrous margins. Ligule 2 to 4 mm. long, somewhat narrowed to the broad, rounded apex, thin but firm. Blades 1 to 3 dm. long, 1.5 to 3.5 mm. wide, usually somewhat involute, especially toward the filiform apex, strongly scabrous on the nerves and margins, sparsely short pubescent above. Panicle 10 to 16 cm. long, 2 to 3 cm. wide, oblong-lanceolate, acuminate, erect, strongly flexuous, contracted, densely flowered, light brown, sometimes tinged with pale purple; rachis rather slender, scabrous, the lowest internode about 2 cm. long; branches slender, somewhat flexuous, strongly hispidulous, the lower primary branches in 3's or 4's, nearly erect or somewhat spreading, the longest 3 to 3.5 cm. long. Spikelets about 4 mm. long. Empty glumes ovate-lanceolate, sharp-acuminate, rounded on the back, thin but firm, scabrous on the nerves, elsewhere obscurely scabrous-punctate to short-strigose, the first somewhat longer. Flowering glume nearly 1 mm. shorter than the second empty glume, ovate oblong, minutely 4-dentate, thin-membranous with hyaline margins and tip, minutely scabrous on the back; awn attached two-fifths to three-fifths above the base, 1.5 to 2.5 mm. long, slightly exceeding the glume, straight, erect, slender to rather stout. Palea mostly two-thirds, sometimes three-fourths as long as the flowering glume, ovate-oblong, bidentate, glabrous. Anthers about 2 mm. long. Callus-hairs copious, rather stiff, spreading, bright white, the longer considerably (sometimes 1 mm.) longer than the flowering glume. Prolongation of the rachilla with its hairs about equaling the longer ones of the callus.

Allied to *C. lapponica* (Wahl.) Hartm., from which it differs in its more cespitose habit, culms rather closely invested at base with numerous marcescent sheaths, stouter rootstock, longer and firmer ligule, more involute leaf-blades, more flexuous, less interrupted, and more densely flowered panicle, broader, more abruptly pointed, usually less scabrous empty glumes, straight awn and shorter palea.

Type specimen in the United States National Herbarium, collected along the Yukon River, Alaska, by Frederick Funston (157), in August, 1893.

Callus-hairs sparse, much shorter than the glume.

28. *Calamagrostis cusickii* Vasey, Monog. Grasses U. S., Contr. U. S. Nat. Herb. 3: 81 (1892). *Deyeuxia cusickii* Vasey; Coult. Bot. Gaz. 10: 224 (1885).

Eastern Oregon and northern California.

Type specimen in the United States National Herbarium, collected in the shade of *Pinus contorta* Dougl. on the Eagle Creek Mountains, eastern Oregon, altitude 1,520 to 1,824 meters, by W. C. Cusick (814), in 1879; "rarely sends up culms."

SPECIMENS EXAMINED.—*Oregon*: Eagle Creek Mountains, altitude 1,520 meters (Cusick 814), 1879. *California*: Cahto, Mendocino County (Bolander, 1159).

Related to *C. suksdorffii* but distinguished by its greater size, numerous innovations with very long, lax leaf-blades, and shorter, straight or but slightly bent, usually included awn.

29. ***Calamagrostis scopulorum*** M. E. Jones, Proc. Calif. Acad. Sci. (II) 5: 722 (1895).

Utah.

Type specimen collected at the base of sandstone cliffs along the Virgin River, above Springdale, altitude 1,216 meters, by M. E. Jones (6075), September 25, 1894.

CALAMAGROSTIS SCOPULORUM LUCIDULA Kearney, var. n.

Smaller, pale but not glaucous (*C. scopulorum* is conspicuously white glaucous throughout), apparently more cespitose; with short, firm leaf-blades (elongated and lax in *C. scopulorum*); stricter, greenish or lead colored, somewhat shining panicle; and more compressed spikelets.

Type specimens collected at Altah, Wahsatch Mountains, Utah, altitude 2,584 meters, by M. E. Jones (1145),¹ 1879.

A very distinct form, and with more complete material it will probably be found expedient to separate it as a species.

† Prolongation of rachilla bearded only near apex, caryopsis pubescent.

30. ***Calamagrostis cinnoides*** (Muhl.) Bart., Comp. Fl. Phila. 1: 45 (1818). *Agrostis glauca* Muhl. Descr. Gram. 76 (1817), not *Arundo glauca* Bieb. *Arundo cinnoides* Muhl. Descr. Gram. 187 (1817). *Calamagrostis canadensis* Nutt. Gen. 1: 46 (1818), not Beauv. *Arundo stricta* Spreng. Neu. Entdeck. 1: 247 (1820). *Phalaris arundinacea* Spreng. l. c. *P. americana* Spreng. l. c. *Calamagrostis langsdorffii marylandica* Trin. Gram. Unifl. 225 (1824). *C. glauca* Trin. l. c. *Arundo coarctata* Torr. Fl. U. S. 94 (1824). *A. canadensis* Nutt., Steud. Nom. Ed. 1: 144 (1840). *Calamagrostis nuttalliana* l. c. 251. *Calamagrostis coarctata* Torr. Fl. N. Y. 2: 444, Pl. 151 (1843). *Deyeuxia nuttalliana* Vasey Descr. Cat. Grasses U. S. 51 (1885).

Maine to Ohio, middle North Carolina, and central Alabama.

Type specimen collected in swamps in Pennsylvania.

SPECIMENS EXAMINED.—*Maine*: Wells, (Blake). *New Hampshire*: White Mountains (Oakes). *Massachusetts*: Ipswich, (Oakes); Salem, (Pickering); Essex County, (Conant). *Connecticut*: Litchfield, (Torrey), (Eaton); New Haven, (J. A. Allen), 1879; Bridgeport, (L. N. Johnson); Stratford, (Eames), 1895. *New York*: Arlington, Staten Island, (Britton), 1895. *Pennsylvania*: Philadelphia, (Conrad); Pocono Plateau, (Traill Green), 1858-59; Pocono Summit, Monroe County, (Porter), 1889; Tobyhanna, (Britton), 1887; Smithville, Lancaster County, (Porter, Small); Penryn, (Small), 1889. *New Jersey*: Hackensack Meadows, (Torrey); Middleton, (Gray), 1833; Egg Harbor, (Vasey), 1884. *Delaware*: Dover, (Canby), 1863. *Maryland*: Baltimore, (Foreman), 1873; Takoma Park, Prince George County, (Scribner, Kearney), 1894-95. *District of Columbia*: Terra Cotta, (Ward), 1877. *North Carolina*: (McCarthy), 1884; Dunns Mountain, Rowan County, altitude 301 meters, (Small), 1894. *South Carolina*: Casars Head, (J. D. Smith), 1881. *Ohio*: (Bolander). *East Tennessee*: (P. L. Cobb), 1891. *Alabama*: Tuscaloosa, (Mohr); Cullman, (Eggert 62), 1897.

¹ M. E. Jones's 1145A is the same.

The most isolated as to relationship of the North American species, differing from all others in its hairy caryopsis and its prolongation of the rachilla villous only near the summit. In habit and appearance it resembles some of the European species of the Section *Epigeos*.

**Leaf-blades strongly involute.

†Culms and usually almost filiform leaf-blades not rigid, plant not strongly cespitose.

31. CALAMAGROSTIS LAXIFLORA Kearney, sp. n. *C. neglecta gracilis* Scribn.; Coulter Bot. Gaz. 11, 175 (1886), not *C. gracilis* Seenius.

A small, nearly glabrous species of pale color and soft texture, with slender creeping rootstocks, short (4 cm. or less), erect innovations, strict culms, involute leaf blades and small, rather open and flexuous panicles. Culms 2.5 to 3.5 dm. high, slender, with a few short, loose, thin, marcescent sheaths at base; internodes usually 3, the uppermost finally exceeding its sheath, the others apparently shorter than their sheaths. Sheaths open toward summit, thin but rather firm, glabrous. Ligule about 3 mm. long, truncate, thin but rather firm, nearly glabrous. Blades 5 to 13 (mostly about 10) cm. long, 2 to 3 mm. wide, strongly involute from the base to the filiform tip, erect or nearly so, slightly scabrous on the margins and nerves on the upper surface. Panicle 4.5 to 7 cm. long, 1 to 2 cm. wide, ovate to oblong-lanceolate, acutish, erect, strongly flexuous, rather open and loosely flowered, straw-color tinged with pale purple; rachis slender, strongly flexuous, glabrous below, sparsely and minutely hispidulous above, the internodes comparatively elongated, the lowest about 1 cm. long; branches slender, strongly flexuous, rather loosely flowered, somewhat sparsely hispidulous, the lower primary branches mostly in 3's, somewhat spreading (sometimes nearly 45 degrees), the longest 1.5 to 2.5 cm. long. Spikelets about 3 mm. long. Empty glumes lanceolate to ovate-lanceolate, short acuminate, rather strongly keeled, minutely hispidulous on the keel, otherwise glabrous, thin, firm, membranous, the first slightly longer. Flowering glume 2.5 to 3 mm. long, slightly shorter than the second empty glume, ovate, narrowed to the truncate apex, minutely 4-dentate, hyaline, nearly glabrous; awn attached one-third to two-fifths above the base, equaling or very slightly exceeding the glume, very slender, erect, straight. Palea about three-fifths as long as the flowering glume, ovate oblong, minutely bidentate, glabrous. Anthers 2 mm. long. Callus-hairs not copious, soft, bright white, slightly shorter than to equaling the flowering glume. Prolongation of the rachilla, with its rather sparse hairs about equaling the longer ones of the callus.

Type specimen in the United States National Herbarium collected in meadows on the East Fork of the Yellowstone River, Yellowstone Park, by Frank Tweedy (582), in August, 1885.

Related to *C. neglecta*, but readily distinguished by its smoothness, pale color, more open and flexuous, loosely flowered panicle and longer callus hairs. Separated from *C. neglecta* in the National Herbarium as a variety by Dr. Vasey.

32. Calamagrostis neglecta (Ehrh.) Gaertn.; Gaertn. Mey. und Scherb. Fl. Wetterau 1: 94 (1799). *Arundo neglecta* Ehrh. Beitr. 6: 84, 137 (1791). *A. stricta* Timm.; Siemss. Mecklenb. Mag. 2: 235; Schrad. Fl. Germ. 215 (1806). *Calamagrostis stricta* Koel. Deser. Gram. 105 (1802). *Deyeuxia neglecta* Kunth Rev. Gram. 1: 76 (1835). *Calamagrostis coarctata* Hook. Fl. Bor. Am. 2: 240 (1839). *C. lapponica* A. Gray, Proc. Am. Acad. 6: 78 (1866) in part. *Deyeuxia neglecta brevifolia* Vasey, Macoun Cat. Can. Pl. 4: 206 (1888).

Labrador to Alaska, south to northern Maine, Wisconsin, Colorado, and Oregon; northern Europe and northern Asia.

Type specimen collected at Upsala, Sweden.

SPECIMENS EXAMINED.—*Arctic seacoast*: (Richardson). *Labrador*: (Morison 401 in Herb. Hook.); Ungava Bay, (Turner); Independent, (Waghorne), 1892; Eagle River, (Waghorne), 1893. *Newfoundland*: Long Point, (Waghorne), 1892; Bay of Islands, (Waghorne 55), 1896; Holton, (Waghorne), 1892. *Nova Scotia*: Amherst

Island, (Richardson 17412 H. G. S. C.), 1880. *Prince Edward Island*: Mount Stewart, (Macoun 17413 H. G. S. C.), 1888. *New Brunswick*: Shediae, (Brittain 17411 H. G. S. C.), 1884; Ingleside, (Brittain 21), 1890. *Canada*: (Pursh). *Quebec*: Cape Rosier, Gaspé, (Macoun 17416 H. G. S. C.), 1882. *Maine*: Fort Fairfield, Aroostook County, (Fernald 182), 1893. *Northeast Territory*: East Main River, (A. H. D. Ross 17415 H. G. S. C.), 1892. *Ontario*: Shore Lake Superior, (Macoun 132), 1869. *Wisconsin*: Madison, (Hale), 1860. *Minnesota*: (No data). *Assiniboin*: Cypress Hills, (Macoun 13106 H. G. S. C.), 1895. *Montana*: (Scribner 361), 1883. *Colorado*: Twin Lakes, (Wolf 721, 1013, 1097), 1873; Georgetown, (Shear 618), 1895. *Idaho*: (Wheeler Expedition), 1871. *Alaska*: Fort Yukon, (Bates), 1889. *Northwest Territory*: Fort Pelly Banks, (Dawson 99), 1887, type of *Deyeuxia neglecta brevifolia* Vasey. *Washington*: Spokane County, (Suksdorf 90), 1884. *Oregon*: Camp Polk, (Howell 168), 1885; Columbia Plains, (Nuttall). *Rocky Mountains*: (Hall and Harbour 649), 1862.

An extremely variable species throughout its range. The unsatisfactory condition of the European forms makes it impossible at present to clearly define the species as represented in North America. Extreme forms approach *C. strigosa* (Wahlenb.) Hartm. in their narrow, sharp-acuminate, scabrous empty glumes, but are distinguished by their strongly involute leaves and smaller spikelets. On the other hand, specimens from Long Point, Newfoundland, collected by Waghorne, somewhat resemble *C. laponica* (Wahlenb.) Hartm. in their lanceolate, rather open panicles, thin and nearly glabrous empty glumes, and curved, almost geniculate awn, but differ markedly in their small size, closely involute leaves, small spikelets, and narrow, empty glumes. Other specimens from Holton and Independent, Newfoundland, approach forms of *C. hyperborea*, differing chiefly in their softer texture and less scabrous glumes.

CALAMAGROSTIS NEGLECTA BOREALIS (Laest.) Kearney, n. comb. *C. borealis* Laest. Bidr. Vaextl. Torn. Lappm. Ups. 44 (1860). *C. stricta borealis* Lange Consp. Fl. Grænl. 161 (1880). *Deyeuxia vancouverensis* Vasey, Bull. Torr. Club 15: 48 (1888). *Deyeuxia borealis* Macoun Cat. Can. Fl. 4: 207 (1888).

Small (2 to 3 dm. high); longest leaf-blades not exceeding 1 dm.; panicle small, 3 to 5 cm. long, 5 to 10 mm. wide, spikelike, usually very dense, dark purple or chestnut brown; spikelets about 3 mm. long; empty glumes ovate, acute; flowering glume nearly equaling the empty ones.

Labrador and the Hudson Bay region; northern Europe.

Type specimen collected in Lapland.

SPECIMENS EXAMINED.—*Labrador*: Attikonak Branch, Hamilton River (Low 6080, 6081, G. S. C.), 1894. *Northeast Territory*: Fort George, James Bay (J. M. Macoun 125, 17414 H. G. S. C.), 1887 (type of *Deyeuxia vancouverensis* Vasey and of *D. borealis* Macoun).

This variety is related to *C. holmii* Lange,¹ which, however, is even a smaller plant (mostly about 1 dm. high), with ascending culms, leaves crowded at the base of the culm with short comparatively widespread blades, longer spikelets and more acuminate empty glumes.

CALAMAGROSTIS NEGLECTA CANDIDULA Kearney, var. n.

Whole plant pale and glaucous; culms 3 to 4 dm. high, rather hard and rigid, comparatively stout, sometimes strongly arcuate below; leaf-blades somewhat rigid; panicle 6 to 10 cm. long, 1 to 1.5 cm. wide, oblong-lanceolate, densely many-flowered, whitish, tinged with pale purple; spikelets about 4 mm. long; empty glumes rather firm in texture; flowering glume considerably shorter than the

¹Lange: Holm Novaia-Zemlias Vegetation 20, t. 1, p. 2 (1887). A form of this species has been collected on Wrangel Island, Siberia, and many extend to some of the Alaskan islands.

second empty one; awn attached one-fifth to two-fifths above the base, not nearly equaling the glume, rather stout, somewhat curved; palea very nearly equaling the flowering glume; callus-hairs very sparse, the lateral ones about three-fifths as long as the flowering glume, the dorsal ones much shorter; prolongation of the rachilla with its hairs somewhat shorter than the palea.

Type specimen in the herbarium of the geological survey department of Canada (7483), collected on open prairies, evidently in wet soil, in the Cypress Hills, Assiniboia, by John Macoun, June 20, 1894.

A very distinct variety, and may prove to be a good species.

CALAMAGROSTIS NEGLECTA WRIGHTII Kearney, var. n.

Small (2 to 3 dm. high); innovations numerous; leaf-blades nearly flat, 2 to 3 mm. wide; panicle small (4 to 5 cm. long), flexuous, few-flowered.

Type specimen in the United States National Herbarium, collected on Arakamchetchene Island, Bering Straits, by Charles Wright (U. S. North Pacific Expl. Exp.), 1853-56, and distributed as *C. strigosa* Bong.

33. CALAMAGROSTIS MICRANTHA Kearney, sp. n.

A slender plant of rather soft texture, with slender creeping rootstocks, erect elongated innovations, erect culms rather closely enveloped at base by a few long marcescent sheaths and contracted spike-like panicles of very small spikelets. Culms 4.5 to 5.5 dm. high, very slender, strict; internodes 3, the two upper much exceeding their sheaths, the uppermost finally exceeding both sheath and blade. Sheaths closely embracing the culm, thin, glabrous. Ligule 1.5 mm. or less in length, truncate or rounded, rather firm, glabrous, whitish. Blades (of innovations and the lower cauline) about 2 dm. long (uppermost cauline), 6 to 12 cm. long; all 1 to 1.5 mm. wide, involute filiform near apex but elsewhere flat, erect but not rigid, thin, scabrous on the margins, minutely scabrous-pubescent on the nerves above, glabrous beneath. Panicle about 8 cm. long, 1 cm. in greatest width, narrow-oblong, acutish, erect, sometimes somewhat flexuous toward apex, densely flowered, somewhat interrupted toward base, dark purple; rachis slender, sparsely scabrous-pubescent (nearly glabrous toward base), its lowest internode about 1.5 cm. long; branches slender, appressed, minutely scabrous-pubescent, flexuous, densely flowered, the lower primary branches in 1's to 5's, the longest 1 to 1.5 cm. long. Spikelets about 2 mm. long. Empty glumes ovate, acutish, rounded on the back, thickish, strongly hispidulous on the keel, elsewhere scabrous especially toward apex, dark red-purple, the first slightly longer and narrower. Flowering glume only slightly shorter than the empty glumes, broadly ovate, deeply bifid, minutely denticulate, rather firm-membranous with hyaline tip and edges, scabrous-punctate on the back, usually tinged with red-purple; awn attached at the middle or slightly below, 1 to 1.5 mm. long, usually considerably exceeding the glume (sometimes merely equaling it), straight, comparatively stout. Palea about three-fourths as long as the flowering glume, much narrower, strongly keeled, bifid, glabrous. Anthers about 1 mm. long. Callus-hairs soft, usually one-half (sometimes four-fifths) as long as the flowering glume. Prolongation of the rachilla, with its sparse hairs, somewhat surpassing those of the callus.

Type specimen in the United States National Herbarium, collected in a "mooskeg" north of Prince Albert, Saskatchewan, by John Macoun (13111 G. S. C.), July 1, 1896.

Nearly related to and resembling in habit and appearance *C. neglecta* from which it differs in its flatter leaves, narrower panicles, very small spikelets, and ovate, merely acutish, thicker and more scabrous empty glumes.

† Culms and usually wider leaf-blades rather hard, more or less rigid.

‡ Panicle elongated, rather loosely flowered, plant tall, not cespitose, or but slightly so.

34. **Calamagrostis inexpansa** A. Gray, Gram. et Cyp. 1: No. 20 (1834); Torr. Fl. N. Y. 2: 445, t. 152 (1843). *C. confinis* A. Gray Man. Ed. 2, 547 (1856), not Nutt. (?)¹
C. neglecta confinis Beal Grasses N. Am. 2: 353 (1896).

New Jersey and western New York to South Dakota and Colorado.

Type specimen collected at Penn Yan, Yates County, N. Y., by Dr. Sartwell in 1833.

SPECIMENS EXAMINED. *New Jersey*: (A. Gray). *New York*: Penn Yan, Yates County, (Sartwell) 1833. *Pennsylvania*: Lycoming County, (McMinn), 1869. *Illinois*: Chicago, (Babcock), 1873. *Minnesota*: (Sandberg), 1891. *Iowa*: Emmett County, (Cratty), 1882; Armstrong, (Cratty 311); Marshalltown, (Eckles), 1896. *Missouri*: Courtney, (Bush), 1890. *South Dakota*: Rosebud, (Wallace 31), 1896. *Wyoming*: Albany County, (Buffum 12), 1891. *Colorado*: Pen Gulch, altitude 2,432 meters, (Vasey), 1884.

On the western limit of its range *C. inexpansa* appears to intergrade with *C. hyperborea elongata*, but is in the main readily distinguished from any form of that species by its less cespitose or not at all cespitose and less rigid habit, taller culms less closely enveloped at base by the marcescent sheaths often longer and proportionately narrower leaf-blades, longer and looser panicle with longer internodes and branches, usually longer spikelets, and usually more pointed empty glumes.

CALAMAGROSTIS INEXPANSA CUPREA Kearney, var. n.

Somewhat stouter and more rigid; panicle more densely flowered, sometimes 4 cm. wide; spikelets smaller, 3 to 4 mm. long; empty glumes copper-colored or dark purple, with copper-colored tips.

Type specimen in the United States National Herbarium, collected in shallow water, Falcon Valley, Washington, by W. N. Suksdorf (910), July 9, 18, 1886. Distributed as *Deyeuxia canadensis* Beauv. var.

SPECIMENS EXAMINED: Falcon Valley (Suksdorf 143, 202, 910), 1885-86.

CALAMAGROSTIS INEXPANSA BARBULATA Kearney, var. n.

Culms stout, pubescent just below the strongly constricted nodes with short, reflexed hairs, slightly scabrous for some distance below the pubescence; sheaths strongly twisted; panicle rather rigid, purplish; awn very short, attached above the middle, not equaling the glume, often entirely wanting.

Type specimen in the United States National Herbarium, collected in Mason County, Wash., by Charles V. Piper (947), July 26, 1890. An imperfect specimen, not showing the basal parts. May prove to be a distinct species.

35. CALAMAGROSTIS CALIFORNICA Kearney, sp. n.

Slightly glaucous, apparently not cespitose, with elongated (sometimes 15 cm. long), erect innovations; tall, strict but not rigid, slender culms; long, narrow leaf-blades and long, narrow, contracted panicle. Culms 7.5 to 10 dm. high, with one or two long, loose, thin marcescent sheaths at base; nodes inconspicuously or not at all constricted; internodes 3, the two upper finally elongated and exceeding their sheaths, the uppermost greatly exceeding both sheath and blade. Sheaths rather loose, glabrous except the minutely scabrous margins. Ligule 2 to 3 mm. long, broadly truncate, firm-membranous, minutely ciliate. Blades (of lower leaves and innovations) 2 to 4 dm. long (uppermost caudine)

¹ *Calamagrostis confinis* Nutt. Gen. 1: 47 (1818) is based upon *Arundo confinis* Willd. Enum. Hort. Berol., 127 (1809). Willdenow's description does not apply to *C. inexpansa*, for he describes the awn as geniculate and as resembling that of *Arundo sylvestris* Schrad. (*C. sylvatica* DC). What Willdenow's plant really was can not be determined from his characters. *Calamagrostis porteri* A. Gray corresponds in every particular, except its short callus hairs.

2 dm. or less in length, all 1 to 4 mm. wide, strongly involute and almost filiform (or occasionally nearly flat), erect, more or less flexuous, thickish, strongly hispidulous-scabrous on the margins and on the upper surface, glabrous beneath. Panicle about 2 dm. long, about 2 cm. wide, oblong-lanceolate, acuminate, erect, flexuous, straw-colored, faintly tinged with purple; rachis slender, sparsely scabrous above, glabrous toward base, its internodes somewhat elongated, the lowest about 4 cm. long; branches slender, appressed, rather densely flowered, scabrous-pubescent, the lower primary branches in 6's to 8's, the longest 5 to 6.5 cm. long. Spikelets about 4 mm. long. Empty glumes lanceolate, acuminate, somewhat strongly keeled toward apex, thin membranous, hispidulous on the keels, elsewhere strongly scabrous, the first slightly longer. Flowering glume about 3 mm. long, slightly shorter than the second empty glume, ovate, broadly truncate, very minutely 4 to 6 dentate, thin membranous with subhyaline edges and tip, scabrous on the back; awn attached about two-fifths above the base, equaling or slightly shorter than the glume, straight, rather stout. Palea about three-fourths (rarely four-fifths) as long as the flowering glume, oblong-ovate, deeply bifid with obtuse teeth, glabrous. Anthers about 2 mm. long. Callus-hairs copious, soft, bright white, the longer one-half (occasionally three-fifths) as long as the flowering glume. Prolongation of the rachilla, with its hairs equaling or slightly exceeding the palea.

Type specimen in the United States National Herbarium, collected in the Sierra Nevada Mountains, California, by J. G. Lemmon (444), 1875.

Much resembling and nearly related to *C. inexpectata*, but differing in its somewhat softer texture; culms glabrous, with nodes not constricted; ligule shorter (about one-half as long) and thicker; leaf-blades glabrous beneath; spikelets mostly smaller; empty glumes nearly equal, less sharply acuminate, thinner and usually less scabrous; flowering glume sometimes 6-dentate; awn longer, attached somewhat higher and less scabrous; palea broader, more conspicuously toothed; and hairs of the callus and of the prolongation of the rachilla much shorter.

†[†] Panicles mostly short, dense, spiciform; plants usually low and strongly cespitose.

36. CALAMAGROSTIS LABRADORICA Kearney, sp. n.

A small rigid plant of hard texture, somewhat glaucous, short-stoloniferous, with erect rather long innovations, strict culms, erect strongly involute leaf-blades and narrow spike-like panicles. Culms 3.5 to 5 dm. high, rather stout, closely enveloped at base by the rather long marcescent sheaths; internodes 3, the two upper finally much exceeding their sheaths. Sheaths closely embracing the culm, glabrous. Ligule 1.5 to 3 mm. long, somewhat narrowed to the broad, truncate or rounded apex, firm, glabrous. Blades 5 to 20 cm. long, 2.5 mm. or less wide, strongly involute, filiform toward apex, erect, thick, scabrous on the margins and nerves above, glabrous beneath. Panicle 6 to 9 cm. long, 0.5 to 1 cm. wide, linear to oblong-lanceolate, acutish, erect, strict, strongly interrupted toward base; rachis stout, straight, glabrous below, somewhat scabrous above, the lower internodes comparatively elongated, the lowest 1 to 2 cm. long; branches short, stout, appressed, densely flowered, not strongly flexuous, rather sparsely scabrous, the lower primary branches mostly in 3's, the longest 1.5 to 2 cm. long. Spikelets about 4 mm. long. Empty glumes ovate to ovate-lanceolate, acute, not strongly keeled, sparsely hispidulous on the keels, otherwise nearly glabrous, firm, thickish, almost chartaceous, dark red-purple at least on the edges and tip, equal in length or the first slightly longer. Flowering glume about 3.5 mm. long, slightly shorter than the second empty glume, broad, ovate-oblong, broadly truncate, usually minutely 4-dentate with rounded teeth, firm membranous with thinner edges and tip, minutely scabrous on the back; awn attached from one-third to one-half above the base, not nearly equaling the glume, slender (or occasionally rather stout), straight, erect, minutely scabrous. Palea two-thirds to three-fourths as long as the flowering glume, much narrower,

oblong, bidentate with obtuse teeth. Anthers nearly 2 mm. long. Callus-hairs rather copious, rather stiff, bright-white, the longer one-third shorter than to nearly equaling the flowering glume. Prolongation of the rachilla, with its hairs nearly equaling the flowering glume.

Labrador.

Type specimen in the United States National Herbarium, collected at Bonne Esperance, Labrador, by J. A. Allen (18), July 29, 1882.

SPECIMENS EXAMINED.—*Labrador*: Bonne Esperance (J. A. Allen 18), 1882; Fox Harbor, lat. $52^{\circ} 22'$ (J. A. Allen), 1882.

Related to *C. hyperborea*, differing in its small size, slender, much interrupted panicle, thicker nearly glabrous empty glumes, and short awns.

37. *Calamagrostis hyperborea* Lange, Fl. Dan. 50: t. 3 (1880); Conspl. Fl. Groenl., 160 (1880). *C. stricta robusta* Vasey in Rothr.; Wheeler Rep. 6: 285 (1878), not *C. robusta* C. Muell. *C. robusta* Vasey, Monog. Grasses U. S., Contr. U. S. Nat. Herb. 3: 82 (1892).

Greenland to Alaska, south in the mountains to Vermont, Colorado, Arizona, and California.

Type specimen collected at Igaliko, near Julianehaab, southern Greenland, by I. Vahl.

SPECIMENS EXAMINED.—*Greenland*: Kingua, Tunugdliarfik Fjord, (Rosenvinge), 1888. *Labrador*: (Waghorne 17417 H. G. S. C.), 1892. *Newfoundland*: Grand Lake, (Waghorne 43), 1896. *Quebec*: Bescie River, Anticosti Island, (Macoun 40, 17409 H. G. S. C.), 1883. *Ontario*: Northeast coast Lake Superior, (Macoun 158), 1869. *Rupert Land*: Lake Mistassini, (J. M. Macoun 47, 17410 H. G. S. C.), 1885. *Vermont*: Willoughby Lake, (W. Boott), 1862. *Manitoba*: Brandon, (Macoun 13112 H. G. S. C.), 1896. *Saskatchewan*: (Bourgeau), 1857-1859. *Montana*: Deep Creek, altitude 1,368 meters (Scribner 359), 1883; Fort Logan, Belt Mountains, (Scribner 365a), 1883; (Tweedy 1020), 1886; Townsend, (Shear 393, 398, 406; Rydberg 2154), 1895. *Wyoming*: Fort Bridger, (Porter), 1873; East Fork, Yellowstone Park, altitude 2,432 to 2,736 meters, (Tweedy 583), 1885; (Knowlton), 1888. *Colorado*: Twin Lakes, (Wolfe 1099, 1100), 1873, type of *C. stricta robusta* Vasey; Democrat Mountain, Georgetown, altitude 2,500 meters, (Jones 472), 1878; Steamboat Springs, Routt County, (Eastwood 6½), 1891; Georgetown, (Shear 646), 1895. *Alberta*: Morley, (Macoun 55), 1885; Banff, (Macoun 11454 H. G. S. C.), 1891. *Idaho*: Wheeler's expedition, 1871. *Utah*: Lookout Mountain Basin, (H. Engelmann), 1858-59; Fish Lake, altitude 2,736 meters, (Jones 5785), 1894. *Arizona*: Willow Springs, (Palmer 616), 1890. *Alaska*: Unalaska, (Kellogg 154), 1871-72. *Northwest Territory*: Fort Pelly Banks, (Dawson 97, 17405 H. G. S. C.), 1887. *British Columbia*: Spences Bridge, (Macoun 17400 H. G. S. C.), 1889; Shuswap Lake, (Macoun, 17404 H. G. S. C.), 1889; Deer Park, Lower Arrow Lake, (Macoun 174044 H. G. S. C.), 1890; Ainsworth, Kootanie Lake, (Macoun 17406), 1890. *Washington*: Cascade Mountains (Dr. Cooper). *Oregon*: Union County, (Cusick), 1879. *California*: Humboldt County, (Kellogg and Harford 1090), 1868-69.

Variable in size of the spikelets, comparative length of the glumes, length and position of the awn, length of the callus hairs, etc., but rather constant and well defined in aspect and in the characters of the organs of vegetation. An imperfect specimen from Alaska, collected by Applegate, apparently referable to this species, has a rather loosely flowered panicle, spikelets fully 6 mm. long and long-acuminate empty glumes. It may possibly be a hybrid with *C. langsdorffii*.

CALAMAGROSTIS HYPERBOREA STENODES Kearney, var. n.

Low, usually about 4 dm. high, with strongly caespitose, slender, rigid culms, closely enveloped at base by the marcescent sheaths; narrow, strongly involute, rather rigid leaf-blades; strict, spike-like panicles 5 to 10 cm. long and about 1 (sometimes only 0.5) cm. wide; smaller spikelets (mostly 3 to 3.5 mm. long), usually less scabrous empty glumes.

Assiniboa to Colorado.

Type specimen in the United States National Herbarium, collected by F. E. Clements (206), Marshall Pass, Saguache County, Colo., altitude 3,344 meters, 1896.

SPECIMENS EXAMINED.—*Assiniboa*; Park Beg, (Macoun 13101, H.G. S.C.), 1896. *Montana*: (F. W. Anderson), 1889; Lima, (Rydberg 2318, 2319), 1895; East Gallatin swamps, altitude 1,520 meters, (Rydberg, 3169), 1896. *Colorado*: Marshall Pass. (Clements 206), 1896; Alamosa, Conejos County, altitude 2,280 meters, (T. A. Williams 2107, Shear 869; Clements 161), 1896; South Park, (Wolf 581, 1098), 1873.

Approaches some forms of *C. neglecta* in its slender culms, narrow, strongly involute leaf-blades and less scabrous empty glumes, but differs in its harder texture, more rigid habit, and thicker glumes.

CALAMAGROSTIS HYPERBOREA ELONGATA Kearney, new name.
Deyeuxia neglecta robusta Vasey: Macoun Cat. Can., Pl. 4: 206 (1888).

Less strongly cæspitose and less rigid than *C. hyperborea*, with fewer innovations; taller (7 to 12 dm. high) culms, less closely enveloped at base by the marcescent sheaths and with usually 4 internodes; longer (sometimes 6 dm. long), laxer, not rarely flattened leaf-blades; longer (10 to 20, usually 12 to 15 cm. long), often more interrupted, but sometimes very dense panicle with the longest branch sometimes 6.5 cm. long; usually smaller spikelets (3 to 4, commonly 3.5 mm. long); and often less pointed empty glumes.

Ontario to British Columbia, south to Pennsylvania, Michigan, Colorado, and California.

Type specimen in the United States National Herbarium, collected by P. A. Rydberg (1494), Plummer Ford, on the Dismal River, Plummer County, Nebr., 1893.

SPECIMENS EXAMINED.—*Pennsylvania*: (F. Peck). *Ontario*: Shore Lake Huron (Macoun 17395 H. G. S. C.), 1871; Elziver North Hastings (Macoun 17397 H. G. S. C.), 1878; Belleville (Macoun 55), 1878. *Michigan*: Isle Royale (Porter) 1865; Thunder Bay Island, Alpena County (Wheeler), 1895. *Wisconsin*: Shore Lake Michigan (Schuette), 1887; valley Wisconsin River, Merrill (Cheney 2799), 1895. *Minnesota*: Fort Snelling (Jarvis); St. Cloud (Campbell), 1887. *Manitoba*: Lake Winnipeg (Richardson); Brandon (Macoun 13112 H. G. S. C.), 1896. *North Dakota*: Sheyenne River prairies (Nicollet), 1839; Willow City, Bottineau County, altitude 456 meters (Brannon 76), 1896. *South Dakota*: Hot Springs, Black Hills, altitude 1,064 meters (Rydberg 1128, 1129), 1892; Brookings, Brookings County, altitude 425 meters (Wilcox 62), 1896; Aberdeen (Griffiths 95), 1896. *Nebraska*: Norway, Middle Loup River, Thomas County (Rydberg 1409 in part), 1893; Mullen, Middle Loup River, Hooker County (Rydberg 1409 in part, 1557) 1893; Plummer Ford, Thomas County (Rydberg 1494), 1893; Thedford, Dismal River, Thomas County (Rydberg 1426), 1893; Central City (Shear 266, Rydberg 2008), 1895; North Platte (Shear 275, Rydberg 2022), 1895. *Northwest Territory*: (J. M. Macoun 17396 H. G. S. C.), 1883. *Assiniboa*: Plains (Douglas 239, 240); Indian Head (Macoun 13100 H. G. S. C.), 1895. *Saskatchewan*: Carlton (Macoun 17367 H. G. S. C.), 1875; Prince Albert (Macoun 13108), 1896. *Montana*: Tenderfoot Creek (R. S. Williams 846), 1890; Box Elder Creek (R. S. Williams 597), 1887; Manhattan (Shear 421, Rydberg 2191), 1895; Madison River (Shear 522), 1895; Castle (Rydberg 3254), 1896; swamps, East Gallatin, altitude 1,520 meters (Rydberg 3179, 3181), 1896; Sheep Creek (Rydberg 3309), 1896; Spanish Creek Basin (T. A. Williams 2072), 1896; Logan (Shear 503), 1895. *Wyoming*: Laramie (Nelson 1179), 1894; (Evermann), 1893. *Colorado*: Veta Pass (Vasey), 1886; Twin Lakes (Wolfe 801, 1101), 1873; Fort Garland, Costilla County, altitude 2,432 meters (Vasey), 1884, (Clements 145), 1896; Gunnison County, altitude 2,432 meters (Cowen 528), 1892; Florissant (T. A. Williams 2140, 2148), 1896; Colorado Springs, altitude 1,824 meters (T. A. Williams 2128), 1896. *Alberta*: Edmonston (Macoun 43, 17365 H. G. S. C.), 1872; Sand Hills (Macoun 17399 H. G. S. C.), 1879. *Utah*: Evanston, altitude 1,824 meters (Watson), 1869; Salt Lake Valley, altitude 1,300 meters (Watson 1290 in part), 1869; Ogden (Tracy 341, 342), 1887. *Nevada*: West

Humboldt Mountains, altitude 1,520 meters (Watson 1290 in part), 1867. *British Columbia*: Home Lake, Vancouver Island (Macoun 17369 H. G. S. C.), 1887; Kicking Horse Lake, altitude 1,520 meters (Macoun 8, 22, 17398 H. G. S. C.), 1890; Ainsworth, Kootanie Lake, altitude 850 meters (Macoun 23), 1890; Rogers Pass, Selkirk Mountains, altitude 1,368 meters (Macoun 17368 H. G. S. C.), 1890. *Washington*: Falcon Valley (Suksdorf 187, 188), 1885; Spokane County (Suksdorf 106), 1884; Spangle, Spokane County (Suksdorf 1099, 1100), 1884-89; (Brandegee 1170), 1883; Douglas County (Sandberg and Leiberg 325), 1893. *Oregon*: Union County (Cusick 1036), 1883; Steins Mountain (Howell), 1885; Otis Creek, Malheur County, altitude 1,100 meters (Leiberg 2331), 1896. *California*: (Lemmon).

More widely distributed than the type and usually growing at lower elevations. Eastward, intergradations with *C. inexpansa* occur. From *C. inerpana*, however, it is usually separable by its more cespitose habit, stouter and more rigid culms, shorter, proportionately denser and more glomerate panicle and often broader and less pointed empty glumes. It is an exceedingly variable form, and difficult to define with any degree of satisfaction.

CALAMAGROSTIS HYPERBOREA AMERICANA (Vasey) Kearney, n. comb. *Deyeuxia neglecta americana* Vasey, Macoun Cat. Can., Pl. 4: 206 (1888). *Calamagrostis stricta* A. Gray, Proc. Am. Acad. 6: 79 (1866), in part, not Koel. *C. americana* Scribn. Bull. Div. Agrost. U. S. Depart. Agric. 5: 27 (1897).

Panicle usually very dense, spikelets smaller, 3 to 3.5 mm. long, empty glumes usually merely acute.

Hudson Bay region to British Columbia, south in the mountains to New England, Colorado, and Oregon.

Type specimen collected on gravel bars at Donald, Columbia Valley, British Columbia, by John Macoun (52), July 8, 1885.

SPECIMENS EXAMINED.—*Northeast territory*: East Main River, (Ross 17376 H. G. S. C.), 1892. *Vermont*: Willoughby Lake, (H. Mann), 1863; Willoughby Mountain, (C. E. Faxon, Grout and Eggleston); Mount Mansfield, (Pringle), 1876. *Saskatchewan*: Bear Lake, (Bourgeau 119); Prince Albert, (Macoun 13104 G. S. C.), 1896. *Assiniboina*: Crane Lake, (Macoun 7484 H. G. S. C.), 1894; Cypress Hills, (Macoun 13106 H. G. S. C.), 1895. *Montana*: Rock Creek, (Scribner 361), 1883; Belt Mountains, (Scribner 360), 1883; Bozeman, (Tweedy 1020), 1886; Lima, (Rydberg 2319), 1895. *Wyoming*: Fossil Station, (Letterman 132), 1885. *Colorado*: (Patterson), 1892; Breckenridge, Summit County, altitude 2,888 meters, (Clements 390), 1896. *Utah*: Evanston, altitude 1,824 meters, (Watson 1290), 1869. *Alberta*: Banff, altitude 1,426 meters, (Macoun 21) 1891; Devils Head Lake, altitude 1,456 meters, (Macoun 22), 1891; Benton Trail, (Macoun 13105 G. S. C.), 1895. *British Columbia*: Donald, (Macoun 52), 1885, type of *C. neglecta americana* Vasey; Rogers Pass, summit Selkirk Mountains, altitude 1,369 meters, (Macoun), 1890. *Oregon*: Southeastern Oregon, (W. Gabb), 1864; Klamath Valley, altitude 1,276 meters, (Cronkhite), 1864.

The type specimen represents the extreme form with very many-flowered panicle, small spikelets (only 3 mm. long), and thinner and smoother empty glumes. Specimens from the mountains of Vermont, approach it most nearly in the characters of the spikelets. Size of spikelets is a very unreliable character in this species, however, as they sometimes vary from 3 to 4 mm. in length in the same panicle. Small specimens with rather broad and thick, merely acute empty glumes and small very dense, oblong panicles (Macoun 21c, Kootanie Lake, British Columbia), approach *C. crassiglumis* Thurb.

38. *Calamagrostis crassiglumis* Thurb.; S. Wats. Bot. Calif. 2: 281 (1880). *Deyeuxia crassiglumis* Vasey Descr. Cat. Grasses U. S. 50 (1885). *C. neglecta crassiglumis* Beal Grasses N. Am. 2: 353 (1896).

Vancouver Island to California.

Type specimen collected in swamps, Mendocino County, Cal., by H. N. Bolander (4766, 4787).

SPECIMENS EXAMINED.—*Vancouver Island*: Home Lake, (Macoun 123, 17372 H. G. S. C.), 1887; Lake Karmutzen, (Dawson 45, 17371 H. G. S. C.), 1885. *Washington*: Whatcom Lake, Whatcom County, (Suksdorf 1024), 1890. *California*: Mendocino, (Bolander 14), 1865; (Bolander 4766, 4787), 1866.

Allied to *C. hyperborea* from which it differs in its small size; short and comparatively wide leaf-blades; small panicle; broad ovate, merely acute, very thick and (except on the keel) obscurely scabrous empty glumes. The California specimens represent the most distinct form. Others approach *C. hyperborea* in their taller culms, smaller spikelets, and more scabrous empty glumes.

II. DESCRIPTIONS OF NEW OR LITTLE-KNOWN GRASSES.

By F. LAMSON-SCRIBNER.

PANICUM LINEARIFOLIUM Scribn., sp. n. (Pl. I.)

A slender, erect, densely cespitose grass, 2 to 4 dm. high, with rather long, linear leaves and open panicles 5 to 8 cm. long. Culms simple or branching near the base, glabrous. Sheaths glabrous or pilose, with rather long (3 mm.), spreading hairs. Ligule a dense fringe of hairs. Leaf-blades 5 to 15 cm. long, about 4 mm. wide, very acute, scabrous on both sides and occasionally sparingly pilose. Panicle-branches solitary or in pairs, more or less spreading, flexuous, scabrous. Spikelets obovate or oblong, obtuse, 2 to 2.5 mm. long. First glume nerveless, pilose at least near the base, broadly obtuse, clasping the base of the spikelet, about 0.5 mm. long; second glume as long as the spikelet, oblong, obtuse, 7-nerved, glabrous or sparingly pilose; third glume as long as the second, obtuse, 7-nerved, glabrous or sparingly pilose, with a palea about half its length. Fruiting glume 2 mm. long, obtuse.

New England, southward to Virginia and westward to Texas.

This species is similar in habit and is very closely related to *Panicum depauperatum*, from which it is at once distinguished by its smaller and more obtuse spikelets. In *Panicum depauperatum* the spikelets are about 3.5 mm. long, and the second and third glumes are decidedly longer than the flowering glume and more prominently nerved, the first glume being distinctly 1- and occasionally 3-nerved, the second usually 9-nerved. When dry the spikelets in *P. depauperatum* have the appearance of being slightly beaked, while in *P. linearifolium* they are distinctly obtuse.

PANICUM EQUILATERALE Scribn., sp. n. (Pl. II.)

A cespitose, glabrous species 3 to 6 dm. high, branching above with long, lanceolate leaves, diffuse panicles 7 to 10 cm. long, and erect (or geniculate at the lower nodes), smooth culms. Sheaths much shorter than the internode, smooth, pubescent, or subciliate on the overlapping margin. Ligule very short, almost obsolete. Leaf-blades 5 to 17 cm. long, 0.5 to 1.5 cm. broad, very acute, smooth beneath, minutely scabrous above, usually with a few long hairs on the margins near the base. Panicle branches spreading somewhat flexuous, pubescent on the axils, otherwise smooth. Spikelets elliptical or obovate, about 3 mm. long. First glume half the length of the spikelet, obtuse or acute, 3-nerved; second and third glumes nearly equal, slightly pubescent, 7 to 9-nerved; the third with an imperfect palea. Flowering glume about as long as the third glume, glabrous.

In pine lands, Florida (No. 1120, George V. Nash, June, 1894); scrubby hummock lands, Florida (No. 1674, George V. Nash, August, 1894).

This species belongs to the group which includes *Panicum commutatum*. The spikelets are more oblong than in that species and the leaves are narrower in proportion to their length. This species is conspicuous for its long, narrow leaves with nearly parallel margins.

PANICUM IMPLICATUM Scribn., sp. n. (Fig. 2.)

A weak, slender, hairy species, 3 to 5 dm. high, with rather short, mostly erect leaves and diffusely branching pyramidal panicles, 3 to 5 cm. long. Culms pilose with soft spreading hairs, with a glabrous ring just below the bearded nodes, soon becoming much branched. Sheaths pilose, bearded at the throat. Leaf-blades lanceolate, pilose on both surfaces, 3 to 5 cm. long, 3 to 6 mm. broad, acute. Axis of the panicle, excepting near the apex, pilose; branches spreading, very flexuous, and usually pilose near the base, otherwise glabrous. Spikelets obovate or oblong, obtuse, about 1.5 mm. long. First glume minute, hardly one-fourth as long as the spikelet; second and third glumes about equal, minutely pubescent, 7-nerved. The third glume with a small palea. Flowering glume smooth and shining, about the length of the third glume. Distinguished from *P. atlanticum* by its more flexuous panicle-branches and smaller spikelets.

Low marshy ground, Cape Elizabeth, Maine.
Collected by F. Lamson-Scribner, July
26, 1895.

This grass was found growing in patches of considerable extent upon marshy land near the seashore. Its reddish or purplish spikelets, panicle-branches, and upper leaf sheaths rendered these patches conspicuous by their color. The delicate and flexuous panicle-branches cause the neighboring panicles to become so entangled that individual specimens are separated with difficulty.

PANICUM BALDWINII. Nutt. in herb. (Fig. 3.) (*Panicum dichotomum* var. *nitidum* Chapman, Southern Flora, first edition. *Panicum nitidum* var. *minor* Vasey Contrib. from National Herbarium 3: page 30. *Panicum ramulosum* Chapman, Southern Flora, Supplement, not Michx.)

A slender and densely cespitose, glabrous perennial 1 to 3 dm. high, much branched near the base, with short, narrow, and more or less spreading leaves, ovoid or pyramidal panicles, 2 to 4 cm. long, and minute spikelets. Sheaths much shorter than the internodes, excepting the loose basal ones, overlapping margins usually ciliate. Ligule a short, dense fringe of hairs. Leaf-blades 1.5 to 5 cm. long, 1 to 4 mm. wide, very acute, glabrous, minutely scabrous on the margins, often with a few long, marginal hairs near the base. Panicle-branches capillary, flexuous, sparingly and minutely scabrous. Spikelets glabrous, ovoid or pyriform, obtuse, about 1 mm. long. First glume rarely more than one fourth as long as the spikelet, obtuse. The second and the third glumes about equal, faintly nerved. Flowering glume and palea rounded-obtuse, about the length of the second and third glumes.

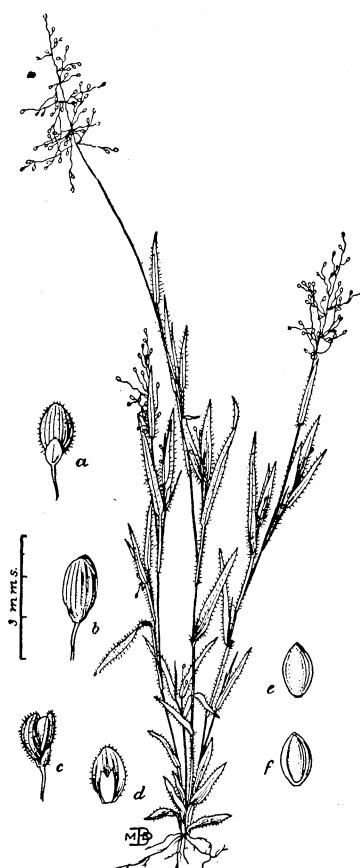


FIG. 2.—*Panicum implicatum* Scribn.; a, b, c, three views of the spikelet; d, third glume, showing small palea; e, dorsal view of the flowering, or fruiting, glume; f, anterior view of flowering glume, showing palea.

Low cultivated ground, Duval County, Fla. (No. 3602, A. H. Curtiss), and moist, recently cultivated ground in Jacksonville, Fla. (No. 5588, A. H. Curtiss.)

This grass was collected many years ago by Mr. Baldwin, and specimens of it in the Herbarium of the Philadelphia Academy of Natural Sciences are ticketed *Panicum baldwinii*, Nutt., which name is here taken up.

PANICUM WRIGHTIANUM Scribn., sp. n. (Fig. 4.)

A slender, much branched, leafy perennial with smooth, delicate panicles and minute spikelets. Culms many-jointed, branched throughout, minutely pubescent. Sheaths shorter than the internodes, excepting on the more crowded branches,

minutely pubescent in the type.

Basal leaves crowded, ovate to ovate-lanceolate, 1 to 2 cm. long, very minutely pubescent beneath, sparingly so above. Cauline leaves 1 to 3 cm. long, 2 to 3 mm. wide, very acute, tapering from near the base, minutely pubescent below, faintly and shortly pilose above in the type. Panicle 2 to 3 cm. long, branches capillary, flexuous, the main axis minutely pubescent below, branches glabrous. Spikelets ovate-oblong to orbiculate, hardly 1 mm. long. First glume about one-third as long as the spikelet or shorter; second and third glumes minutely and densely pubescent, faintly 5- to 7-nerved, obtuse, barely equaling the smooth and shining flowering glume and palea. Third glume with a minute palea in its axil.

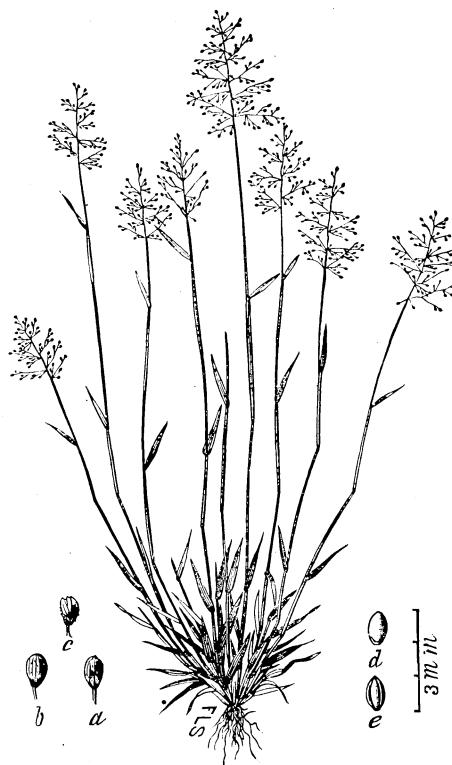
Cuba (No. 3463, C. Wright, 1865); in moist, open areas in pine forests near Biloxi, Miss. (No. 307, Thomas H. Kearney, October, 1896); Horn Island, Biloxi, Miss. (No. 2861, S. M. Tracy, August 20, 1894).

FIG. 3.—*Panicum baldwinii* Nutt. in Herb. Acad. Nat. Sci. Phila.: a, b, c, three views of the spikelet; d, flowering, or fruiting, glume seen from the back; e, anterior view of the fruiting glume, showing palea.

near the base; the culm is minutely pubescent, in *P. baldwinii* it is glabrous. It is further distinguished by the pubescence of its leaves and spikelets.

CHÆTOCHLOA LATIFOLIA Scribn., sp. n. (Pl. III.)

A branching annual, 2 to 4 dm. high, with compressed sheaths, rather broad, flat leaves and bristly panicles 4 to 8 cm long. Culms compressed, slightly scabrous, and short bearded at the nodes. Sheaths striate, scabrous, especially along the keel, papillate-pilose, villous on the overlapping margin. Ligule very short and densely ciliate-fringed with stiff hairs. Leaf-blades broadly lanceolate, cordate at the base, very acute 5 to 6 cm. long, 1 to 2 cm. broad, scabrous on both sides



This species is closely related to *Panicum baldwinii*, but is more branching throughout. In that species the branches are mostly

and especially along the narrow, cartilaginous margin, strongly pilose above and below. Branches of the panicle very short, slightly crowded, spikelets obovate, about 2 mm. long. First glume less than 1 mm. in length, 3-nerved; second glume shorter than the flowering glume, 5-nerved; outer glumes all obtuse, the third one empty. Flowering or fruiting glume about 2 mm. long, strongly convex and deeply transversely rugose excepting near the slightly apiculate apex. Palea transversely rugose and similar in texture to the flowering glume. Bristles 12 to 18 mm. long, strongly scabrous.

Growing under bushes in deep ravines, Durango, Mexico (No. 879, E. Palmer, 1896.)

This species is well marked by its comparatively short and broad leaves which are coriaceous at the base, and long, widely spreading bristles.

STIPA WILLIAMSII Scribn., sp. n. (Pl. IV.)

A rather stout, erect perennial, 7 to 9 dm. high, with rather long, flat leaves and strict panicles, 17 to 22 cm. long. Culms sometimes geniculate at the lower nodes, pubescent at least near the nodes. Sheaths shorter than the internodes and softly pubescent, at least the lower ones. Ligule very short, auriculate. Leaf-blades 15 to 30 cm. long, 2 to 6 mm. wide, long attenuate pointed, pubescent on the back, especially toward the base, scabrous above. Lower panicle-branches 5 to 8 cm. long, the longer ones naked below, shorter ones flower-bearing to the base. Spikelets, exclusive of the awns, about 6 mm. long. Empty glumes lanceolate, with long-acuminate hyaline tips, nearly equal and a little exceeding the flowering glume, the first 3-nerved, the second 5-nerved. Flowering glumes about 6 mm. long, with a sharp-pointed callus, 1 mm. in length, strongly pilose all over with appressed hairs and a distinct crown of hairs at the apex. Palea pilose like the glume and about one-half its length. Awn about 2.5 cm. long, once or twice geniculate and more or less flexuous, minutely scabrous throughout.

Dry soil on the west side of Big Horn Mountain, near Monument Spring, Wyo., altitude 2,200 to 2,400 meters (No. 2804, Thomas A. Williams, August 3, 1897); Rocky knolls, Little Laramie River, Wyoming (No. 2234, Thomas A. Williams,



FIG. 4.—*Panicum wrightianum* Scribn.: a, b, c, various views of the spikelet; d, third glume, showing small palea; e, flowering, or fruiting glume, seen from the back; f, flowering glume, seen from the anterior side, showing palea.

July 2, 1897); near Jefferson City, Mont. (No. 340, F. Lamson-Scribner, June 27, 1883). Named for Thomas A. Williams, assistant agrostologist.

This species has been confounded with *Stipa viridula*, from which it is readily distinguished by its longer and more acute callus and pubescent culms and sheaths. It is more nearly allied to *Stipa viridula* var. *pubescens* Vasey, from Washington State, which possesses the same character of pubescence. In that species, however, the awns are pubescent to the second bend. *Stipa viridula* var. *pubescens* Vasey is equally distinct from *S. viridula* and may be classed as a distinct species and named **S. elmeri** Piper & Brodie, under which name it has recently been distributed by Mr. Elmer. There is a *Stipa pubescens* R. Br.

STIPA NELSONI Scribn., sp. n.

A rather stout, glabrous, cespitose perennial, 7 to 9 dm. high, with long, narrow culm leaves, and strict panicles 15 to 25 cm. long. Culms smooth; sheaths striate, smooth, the overlapping margins pilose with soft hairs. Ligule very short (less than 1 mm.), and minutely fringed on the edge, slightly auricled and pubescent on the sides. Panicle branches appressed, 4 to 5 cm. long, all excepting the longer ones flower-bearing to the base; lowermost branches sometimes 10 cm. long. Empty glumes slightly unequal, the first 9 to 10 mm. long, 3-nerved, the second a little longer and narrower, 5-nerved near the base, both glumes long acuminate-pointed, very thin and hyaline excepting the nerves, which are quite conspicuous. Flowering glumes, including the rather acute callus, 7 mm. long, clothed with soft, silky hairs, which are longest at the shortly two-toothed apex. Palea rather broad, half as long as the glume, pilose on the back, truncate at the apex or irregularly toothed. Awn about 3.5 cm. long, minutely scabrous. Anthers beardless.

Woods Landing, Albany County, Wyo., altitude 2,600 meters (No. 3963, A. Nelson, August 9, 1897); rich soil, Sheep Mountain, "common and affords considerable forage," altitude 2,400 meters (No. 2269, Thomas A. Williams, July 2, 1897.) Named for Prof. Aven Nelson.

This grass has been confounded with *Stipa viridula*, from which it is readily distinguished by its longer and more pointed callus to the flowering glume, and especially by the silvery, comose appearance of the panicle. The silvery appearance is due to the hyaline character of the outer glumes. The details of the spikelets are more nearly those of **Stipa vaseyi** Scribn., new name (*Stipa viridula robusta* Vasey, not *S. robusta* Nutt.), but in that species the outer glumes are quite firm in texture, and minutely but distinctly scabrous all over the back. In this species the glumes are perfectly smooth on the back, and the awns are more than twice as long as in *Stipa vaseyi*.

STIPA MINOR (Vasey) Scribn. (*S. viridula* var. *minor* Vasey Contr. U. S. National Herbarium 3: page 50.)

A densely cespitose, erect, glabrous perennial, 4 to 6 dm. high, with narrow leaves and densely flowered, usually purplish panicles 5 to 12 cm. long. Culms smooth or very minutely pubescent below the nodes. Sheaths smooth. Ligule very short, slightly auricled, broader than the base of the leaf-blade. Leaf-blade 10 to 30 cm. long, 2 to 3 mm. wide, with very long attenuate-involute tips, scabrous on the margins, otherwise smooth. Leaves of the innovations involute and almost filiform, at least when dry. Spikelets 6 to 7 mm. long. Empty glumes lanceolate, sharply acuminate-pointed, 3-nerved near the base, the first slightly broader and longer than the second and less distinctly nerved. Flowering glume, including the short callus, about 4 mm. long, thinly pilose all over with a crown of hairs at the distinctly 2-toothed apex. Palea about three-fourths as long as the glume. Awn once or twice geniculate, about 18 mm. long, very minutely scabrous.

Moist mountain sides, altitude 3,200 meters, Robinson, Summit County, Colo. (No. 1052, C. L. Shear, August, 1896); **Buena Vista, Chaffee County, Colo., altitude 3,500 meters** (No. 1006, C. L. Shear, August, 1896); **Sweetwater County, Wyo., altitude 2,600 meters** (No. 3828, Aven Nelson, July 23, 1897); **Beaver Canyon, Idaho** (No. 301, C. L. Shear, June 27, 1895); **North Park, Colo. (C. S. Crandall, Sept. 5, 1890)**; **Kelso Mountain, near Torrey Peak, Colo., altitude 3,800 meters** (G. W. Lettermann, August, 1885).

In collections this very well-marked and alpine species has often been referred to *S. viridula*.

STIPA TWEEDYI Scribn., n. n. (*Stipa comata intermedia* Scribn. Bot. Gaz. **11**, page 171, not *Stipa intermedia* Trin.)

A densely cespitose, glabrous, and often glaucous perennial 6 to 9 dm. high, with narrow, usually more or less involute leaves and lax, nodding panicles, 20 to 30 cm. long. Sheaths smooth, lower ones generally glaucous. Ligule about 5 to 7 mm. long, broader than the leaf-blade. Leaves of the culm 10 to 15 cm. long, 3 to 5 mm. wide, minutely strigose-scabrous above, smooth beneath. Leaves of the innovations narrower and longer. Base of the panicle usually included in the upper-leaf sheath, its branches solitary or in pairs, naked below. Outer glumes 2 to 2.5 cm. long, the first 3-nerved, the second a little longer than the first and 5-nerved, both with long attenuate-pointed hyaline tips. Flowering glume, including the rather long densely hairy and very acute callus, 12 to 15 mm. long, thinly pilose hairy, apex entire. Awn about 100 mm. long, twice geniculate, straight beyond the second geniculation or only slightly flexuous, scabrous throughout, very minutely pubescent toward the base. Palea as long as the glume, rather broad, pilose on the back. Anthers bearded at the tips.

Junction Butte, Yellowstone Park, altitude 1,800 meters (No. 610, F. Tweedy, 1884-1885); **Sheep Mountain, Laramie, Wyo., "common on the plains and mountain slopes," altitude 2,500 meters** (No. 3297, Aven Nelson, July 3, 1897); **Dry hillsides, Evanston, Wyo.** (No. 2438, T. A. Williams, July 10, 1897); **Tucson, Ariz.** (No. 731, J. W. Toumey); **Gravelly soil along railroad track, Veta Pass, Colo., altitude 2,650 meters** (No. 821, C. L. Shear, July 15, 1896).

This species has been confounded with *Stipa comata*, which it resembles in habit, but in that species the flowering glume, including the callus, is about 8 to 9 mm. long; the awn is more slender, longer, and distinctly flexuous or more or less curled beyond the geniculations.

MUHLENBERGIA PALUSTRIS Scribn., sp. n.

A very slender, much branched perennial, with numerous short and narrow leaves and slender, strict panicles. Culms almost threadlike, reclining or ascending, 3 to 6 dm. long, smooth. Sheaths smooth for the most part shorter than the internodes. Ligule very short, barely 0.5 mm. long, ciliate on the margin. Leaf-blades 2 to 4 cm. long, 2 to 3 mm. broad, minutely scabrous on the upper surface, at least near the base. Panicles terminating the culm or the branches, 5 to 10 cm. long; branches appressed, the longer lower ones 2 to 3 cm. in length, scabrous. Spikelets 2 to 3 mm. long (about 2.5) exclusive of the awn. Empty glumes sub-equal or the first a little shorter than the second, about 0.8 mm. long. Flowering glume 2.5 mm. long, linear-lanceolate, scabrous on the back, especially toward the apex, barbate at the base or on the callus with rather long hairs. Awn slender, straight, or slightly flexuous, 5 to 6 mm. long. Palea about as long as its glume.

Swampy grounds, Brightwood, D. C. (E. S. Steele, September, 1896). Closely related to *Muhlenbergia diffusa*, from which it is readily distinguished by its larger and nearly equal empty glumes.

SPOROBOLUS PALMERI Scribn., sp. n. (Pl. V.)

A densely cespitose, glaucous perennial, 3 to 5 dm. high, with narrow, spreading leaves and diffuse panicles 20 to 30 cm. long. Sheaths smooth, striate, crowded below, bearded at the throat. Ligule a short, dense fringe of hairs. Leaf-blades 5 to 10 or 12 cm. long, 2 to 4 mm. wide, rather rigid, very sharp-pointed, strongly involute when dry and more or less flexuous, smooth and glaucous, especially on the upper surface the whole plant more or less glaucous. Panicle-branches finely spreading, solitary, very smooth, pedicels spreading, somewhat flexuous, primary branches rather rigid, spikelets about 3.5 mm. long. Outer glumes obtuse, the first about 2 mm. long, the second 2.5 mm. long, the flowering glume rather broad-ovate or oblong, obtuse, about 3.2 mm. long, 3-nerved. Palea with very broad margins, equaling or slightly exceeding the flowering glume.

In alkali bottoms, growing in rather dense bunches, near the city of Durango, Mexico, altitude 1,850 meters (No. 180, E. Palmer, June, 1896). The species is named for the collector, Dr. Edward Palmer.

SPOROBOLUS THURBERI Scribn., sp. n. (Fig. 5.) *Vilfa filiculmis* Thurb. in Bot. Mex. Boundary Survey ined.

A slender, very much branched and leafy perennial, 15 to 25 cm. high from creeping rootstocks, with contracted, linear, long exserted panicles 3 to 5 cm. long. Lower sheaths short and crowded, the upper shorter than the internodes; ligule 1 mm. long, lacerate. Leaf-blades 12 to 16 mm. long, convolute, setaceous, rigid, and widely spreading or arcuate, mucronate-pointed. Spikelets straw-colored, 4 to 5 mm. long. Empty glumes broadly lanceolate, acute, about one-third shorter than the third or flowering glume, which is pilose for half its length and mucronate-pointed. Palea very acute, strongly two-nerved, pilose on back, equaling the flowering glume.

Camp 49, Plaza Larga, September 21, 1853, Bigelow. Related to *Sporobolus utilis* but quite distinct from that species, especially in the characters of the spikelets.

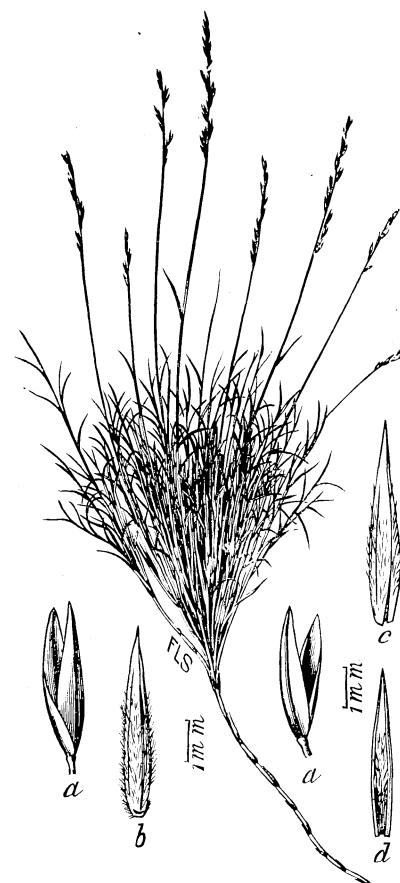


FIG. 5.—*Sporobolus thurberi* Scribn.: a, a', empty glumes; b, floret, seen from the back; c, flowering glume; d, palea.

SPOROBOLUS SIMPLEX Scribn., sp. n. (Fig. 6.)

A low, densely cespitose, leafy annual, 5 to 15 cm. high with slender, smooth culms, very short lower internodes, flat leaves and linear panicles 2 to 4 cm. long. Lower sheaths loose, overlapping. Ligule hyaline, 2 to 3 mm. long, decurrent. Leaf-blades 0.5 to 1.5 cm. long, 1 to 2 mm. broad, scabrous on the margins and on the nerves above, very rough near the rigid apex. Axis of panicle rather rigid,

and with the branches scabrous. Spikelets 2 to 2.3 mm. long. Empty glumes less than 1 mm. in length, broadly obtuse or truncate and occasionally minutely erose-dentate, minutely scabrous on the back above. Flowering glumes 3-nerved, mucronate-pointed or subaristate, scabrous above. Palea a little shorter than the glume.

Type specimen 2411, P. A. Rydberg, Georgetown, Colo., August 19, 1895. H. N. Patterson collected the same form in the same region in 1885. A rigid and apparently a perennial form of this species was collected by C. G. Pringle near Summit Valley in the Sierra Nevada Mountains, California, September 19, 1882, and distributed as *Sporobolus gracillimus*, with which the species is most closely allied. It is distinguished from *S. gracillimus* by its broader, more rigid leaves, more scabrous panicle-branches, and generally stouter habit of growth. It has heretofore been referred to *Sporobolus gracillimus*. No. 1041, C. L. Shear, from Twin Lakes, Colo., August 23, 1896, belongs to *Sporobolus simplex*.

AGROSTIS PALUDOSA Scribn.,
sp. n. (Fig. 7.)

A low, densely cespitose perennial, 10 to 15 cm. high, with soft, narrow leaves; narrow, rather densely flowered panicles, 3 to 5 cm. long. Sheaths smooth, the lower thin and somewhat scarious. Ligule elongated, about 2 mm. long. Leaf-blade soft and flaccid, at least the lower ones, minutely scabrous on the margins, otherwise smooth. Panicle-branches scabrous. Spikelets 3 mm. long. Empty glumes ovate, lanceolate, acute, equal, subciliolate, scabrous on the keel excepting near the base. Flowering glume nearly 3 mm. long, rather broadly obtuse, very minutely punctate-scabrous on the back excepting near the tip, awnless. Palea about 0.5 mm. long, hyaline. Callus very shortly barbate on the sides.

Blanc Sablon, Labrador (Rev. A. Waghorne, September 25, 1893). Apparently a well-marked species, allied to *Agrostis varians*, but with much larger spikelets.

TRISETUM ARGENTEUM Scribn., sp. n. (Fig. 8.)

A slender, erect perennial with smooth culms, 5 to 7 dm. high, very minutely scabrous sheaths and leaves, and narrow, silvery-gray or purplish panicles, 10 to 20 cm. long. Culms minutely pubescent at the nodes and otherwise glabrous. Sheaths minutely pubescent, especially those of the sterile shoots. Ligule about 2 mm. long with a broad, erose or lacerate apex. Leaf-blades linear, 10 to

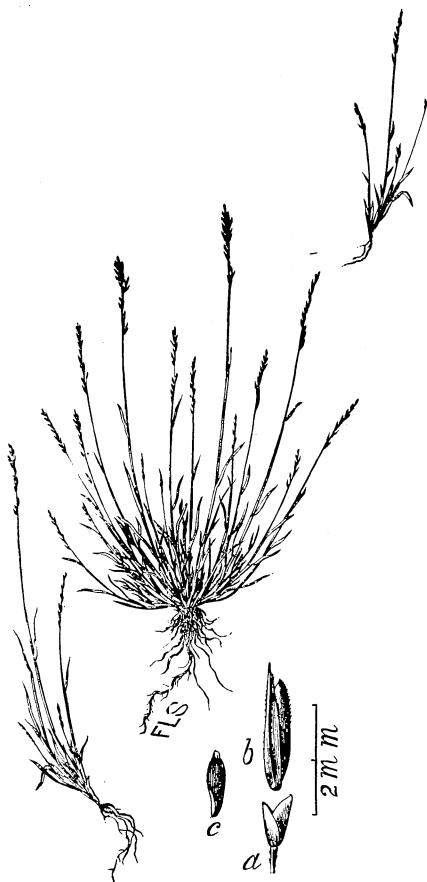


FIG. 6.—*Sporobolus simplex* Scribn.: a, empty glumes; b, spikelet, empty glumes removed; c, grain.

15 mm. long, 3 to 4 mm. wide, long acuminate-pointed, minutely scabrous on the under surface, glabrous above. Panicles rather densely flowered, the main axis and primary branches minutely pubescent; the longer branches 2 to 4 cm. in length, naked below, the shorter ones flower-bearing to the base. Spikelets 4 to 5 mm. long, 1- to 2-flowered, with a hairy prolongation of the rachilla beyond the second flower. When 1-flowered, this prolongation of the rachilla may bear an imperfect glume and awn. Empty glumes unequal, acuminate-pointed. The first 1-nerved and about 3 mm. long; the second 3-nerved and about 4 mm. long or nearly equaling the spikelet. Flowering glumes minutely scabrous on the back. The first about 4 mm. long, narrowly lanceolate, acute or slightly 2-cleft at the apex, awned below the apex. Awn straight and 1 to 3 mm. long. Palea hyaline, nearly as long as the glume, arcuate below, 2-toothed at the apex. Callus shortly barbate, joints of the rachis pilose-hairy.

Among rocks, Las Animas Canyon below Silverton, Colo. (No. 1214, C. L. Shear, August 4, 1897), altitude 2,700 meters. An elegant grass and apparently a well-marked species, nearly related to *T. wolfii* Vasey (fig. 9), which is distinguished by its shorter, narrower leaves, perfectly smooth culms and sheaths, smaller and more loosely flowered and less compressed spikelets and longer hairs on the joints of the rachilla. *T. wolfii* was collected at Twin Lakes, Colo., by John Wolf in 1873, and specimens exactly resembling the type were collected in willow thickets, Twin Lakes, Colo., by Mr. Fred E. Clements (333), August 20, 1896. These are the only specimens in the National Herbarium referable to this species, which is fairly well figured in Bot. Wheeler Expedition, plate 27 (1878).

Trisetum argenteum is distinguished from the closely allied *T. montanum* Vasey by its shorter, straight awns, which are inserted higher up on the glume.

Trisetum muticum (Boland.) Scribn. (fig. 10). *Trisetum subspicatum* var. *muticum* Boland. in herb. Thurb. in S. Wats. Bot. California 2:296, *Trisetum wolfii* Vasey (in part). *Trisetum brandegeei* Scribn. in Bull. Torr. Bot. Club 10:64. This species is in every way stouter than *Trisetum wolfii*, with broader and longer leaves and larger and more densely flowered panicles. The outer glumes are more nearly equal, and the flowering glumes firm in texture, with rougher surface. *Trisetum brandegeei* was based on a robust form of the species.



FIG. 7.—*Agrostis paludosa* Scribn.: a, empty glumes; b, flowering glume, showing a small palea and three stamens.

Trisetum melicoides (Mx.), Scribn., Coult. Bot. Gaz. 1887, p. 167 (*Aira melicoides* Michx., *Graphephorum melicoides* Beauv.) belongs in this group of species.

ZEUGITES PRINGLEI Scribn., sp. n. (Pl. VI.)

A slender, branching perennial, 3 to 6 dm. long, with broadly ovate, acute, petiolate leaves and capillary panicles about 8 to 10 cm. long. Culms and sheaths glabrous, smooth. Ligule 1 to 2 mm. long. Leaf petioles very slender, about 1 cm. in length. Leaf-blades glabrous, 3 to 4 cm. long and 2 cm. broad, rounded at the base, transverse veins conspicuous on the under surface. Branches of the panicle spreading or divergent, very slender. Spikelets 2- to 3-flowered, about 7 mm. long. Outer glumes about 2 mm. long, equal in length; the first 5-nerved, the

second 3-nerved with transverse veins. Apex irregularly toothed, the teeth sometimes short awn-pointed. Glumes of the female floret 4 mm. long, reaching the base of the first staminate floret, terminating in a slender awn, 10 to 12 mm. in length. Staminate floret about 3 mm. long.

Wet mountain canyons near Cuernavaca, State of Morelos, Mexico (No. 7774, C. G. Pringle, November 6, 1896), altitude 1,900 meters.

In habit this species resembles *Zeugites mexicana* Trin., but is at once distinguished by its broader leaves, and awned glumes of the female florets. I have been unable to compare this species with *Zeugites americana* Willd., but it differs from the description of that species in its much longer awn. The awn of *Zeugites americana* of the West Indies is described as being only about one-half the length of the glume, while in *Z. pringlei* the straight awn is 2 to 3 times the length of the glume.

ERAGROSTIS VISCOSA

Scribn., sp. n. (Pl. VII.)

A slender, somewhat wiry perennial with erect, many-jointed culms, 3 to 4 dm. high, narrow, involute (at least when dry) leaves and diffuse panicles 6 to 12 cm. long. Sheaths mostly longer than the internodes and overlapping, viscid, pilose along the margins, at least near the apex, and bearded at the throat. Ligule a very short fringe of hairs. Leaf-blades 4 to 10 cm. long, 2 to 4 mm. wide, strongly involute when dry, scabrous above, smooth beneath.

Axis of panicle and its branches viscid, somewhat rigid, the branches finally spreading or divergent. Spikelets 3 to 4 mm. long, 3- to 5-flowered, appressed to the rachis, and excepting the terminal ones, nearly sessile. Empty glumes acute, subequal, scabrous on the keels; flowering glumes narrowly oblong, obtuse, strongly 3-nerved and scabrous on the keels. Palea a little shorter than the glume, arcuate below, aculeolate-scabrous on the keels above.

Midland, Tex. (J. G. Smith, August 2, 1897). Laredo, Tex. (Mrs. Anna B. Nickels). It is remarkable for being viscid throughout.

POA CAPILLARIS Scribn., sp. n. (Fig. 11.)

A slender, erect, densely-caespitose perennial, 3 to 4 dm. high, with almost capillary and flexuous basal leaves and long-exserted densely-flowered panicles, 3 to 5 cm.



FIG. 8.—*Trisetum argenteum* Scribn.: a, empty glumes; b, two florets, seen from the side.

long. Leaves of the innovations 3 to 6 cm. long, about 1 mm. wide, scabrous above, smooth beneath. Leaves of the culm scabrous above, usually 2, 2 to 4 cm. long, about 2 mm. wide. Ligule hyaline 2 mm. long. Axis of the panicle and its branches scabrous, the longer lower branches 1.5 to 2 cm. long, naked below. Spikelets 3- to 5-flowered, compressed, 7 to 10 mm. long. Empty glumes 4 to 5 mm. long, broadly lanceolate or ovate, acute, 3-nerved, scabrous on the keel. First flowering glume 4 to 5 mm. long, scabrous on the keel and minutely scabrous all over and slightly hairy near the base, with very short appressed hairs. Palea as long as the glume, keels strongly ciliate excepting near the base,

pubescent between the keels, 2-toothed. Joints of the rachilla 1 mm. long, smooth.

Potrero, Cal., April 9, 1892. Specimens received from the herbarium of the California Academy Sciences. Name of collector not given. Allied to *Poa sandbergii*, from which it may be separated by its more densely-flowered panicles, nearly scabrous flowering glumes and smooth rachilla. In *Poa sandbergii* the flowering glumes are villous on the lower half, as are the joints of the rachilla.

POA JUNCIFOLIA Scribn., sp. n.
(Pl. VIII.)

A rather rigid, erect, glabrous perennial, 1.5 to 3 dm. high, with firm, erect leaves and strict panicles 5 to 8 cm. high. Lower sheaths loose, striate, glabrous. Leaves of the innovations about 5 cm. long, involute, scabrous on the margins near the apex. Culm leaves 2 to 3, 2 to 5 cm. long, 1 to 2 mm. wide. Ligule about 2 mm. long, rounded-obtuse, entire. Panicle-branches erect, the longer lower ones 2 to 3 cm. long, naked below, scabrous. Spikelets 3- to 5-flowered, 5 to 6 mm. long, somewhat compressed. Empty glumes broad, ovate-obtuse, sometimes acute, subequal, 3 to 4 mm. long, 3-nerved, with broad, scarious margins, scabrous on the keel near



FIG. 9.—*Trisetum wolsii* Vasey: a, empty glumes; b, two florets without the empty glumes, seen from the side; c, dorsal view of flowering glume; d, palea.

the apex. Flowering glumes minutely scabrous on the back with occasionally a few very short hairs near the base. The first one, 3 to 4 mm. long, obtuse. Palea a little shorter than the glume, subciliate-scabrous along the keels excepting near the apex.

Point of Rocks, Sweetwater County, Wyo. (No. 3721, Aven Nelson, July 13, 1897). Related to *Poa arida* Vasey, from which it is distinguished by its glabrous flowering glumes. In *P. arida* the flowering glumes are shorter, relatively broader, and densely villous towards the base.

POA HANSENI Scribn., sp. n. (Pl. IX.)

A densely caespitose, slender, erect, glabrous, perennial, 2 dm. high, with narrow, chiefly radical and rather firm leaves and long-exserted strict panicles about 4 cm. long. Leaves of the innovations intravaginal 5 to 8 cm. long, less than 1 mm. in width, smooth. Culm leaves 2, 1 to 3 cm. long. Sheaths and leaves glabrous. Ligule very short, obtuse. Panicle branches erect, the longer lower ones 1 to 2 cm. long. Spikelets 4 to 5 mm. long, compressed, 2- to 3-flowered. Empty glumes subequal, 3 to 4 mm. long, acute, scabrous on the keel excepting near the base, minutely scabrous all over, as are the flowering glumes. Flowering glumes lanceolate, acute, scabrous on the keel excepting near the base, hairs none. Palea about the length of the glume with scabrous keels. Callus naked Silver Lake, Amador County, Cal. (No. 605, George Hansen, June 27, 1892). Related to *Poa pringlei*, but readily distinguished by its smaller spikelets. The species is named for Mr. George Hansen, the collector.

POA ATROPURPUREA Scribn., sp. n. (Pl. X.)

A slender, somewhat wiry grass 3 to 4 cm. high from a creeping root-stock, short and rather rigid basal leaves, and densely flowered dark purple panicles, 2 to 4 cm. long. Glumes smooth, usually purplish above. Sheaths smooth, striate. Ligule 1 to 1.5 mm. long, rounded-obtuse or truncate, entire. Leaf-blades of the sterile shoots narrow and involute, at least when dry, 5 to 8 cm. long; those of the culm somewhat broader, glabrous, arcuate, 2 to 8 cm. long, the upper ones much shorter. Panicle long-exserted, the appressed branches densely flowered, the longer ones naked below. Spikelets ovate-obtuse, 3- to 5-flowered, 3 to 4 mm. long, about 2 mm. broad. Axis of the rachilla breaking up, glumes firm in texture, the outer ones nearly equal, ovate-obtuse, about 2 mm. long. First flowering glume 2 to 2.5 mm. long, oblong-ovate, obtuse, and glabrous. Palea about as long as its glume, narrowly scabrous on the keel, grain nearly as long as the palea which incloses it.

San Bernardino Mountains, San Bernardino, Cal. (No. 2968, S. B. Parish, June 18, 1894), altitude 1,900 meters; Bear Valley, San Bernardino Mountains (No. 3696, S. B. Parish, June, 1895).



FIG. 10.—*Trisetum muticum* (Boland.) Scribn.: a, empty glumes; b, three florets, seen from the side, empty glumes removed.

A very well marked species, characterized by rigid basal leaves and densely flowered dark-purple panicles, and especially by its rigid glumes and naked flowering glumes. Distributed as *Poa unilateralis*, with which it has no resemblance excepting in its densely flowered panicle.

POA LONGEPEDUNCULATA Scribn., sp. n. (Pl. XI.)

A slender, erect, and rather densely caespitose grass, 5 to 7 dm. high, from short, creeping rootstocks, with narrow basal leaves and long-exserted and densely flowered panicles, 5 to 7 cm. long. Culms smooth, excepting just below the panicle where they are minutely scabrous as is the main axis of the panicle. Sheaths loose and crowded at the base, minutely scabrous. Ligule about 1 mm.

in length. Leaf-blades of the sterile shoots 5 to 20 cm. long; those of the culm, two or three, the uppermost rarely exceeding 1 cm. in length, sometimes reduced to a mucronate point, lowermost rarely more than 1 cm. long, 1 to 2 mm. wide, minutely scabrous above and below, conspicuously roughened near the rigid apex. Panicle branches 1 to 2 cm. long, the shorter ones flower-bearing to the base. Pedicels scabrous. Spikelets narrowly oblong-lanceolate, somewhat compressed, usually about 6 mm. long, 3- to 5-flowered. Outer glumes minutely scabrous on the keels, the first 2-nerved, the broader second glume 3-nerved, with broadly subhyaline margins. Flowering glumes about 4 mm. long, minutely roughened on the keel, especially near the apex and finely pubescent on the dorsal and marginal nerves near the base. Intermediate nerves indistinct. Palea shorter than the flowering glume, scabrous on the nerves, and very minutely pubescent between them, the apex hyaline, adherent to the grain.

Loose, gravelly soil, summit of Sheep Mountain, Laramie, Albany County, Wyo., altitude 2,700 meters (Aven Nelson, July 3, 1897). Rather scarce.

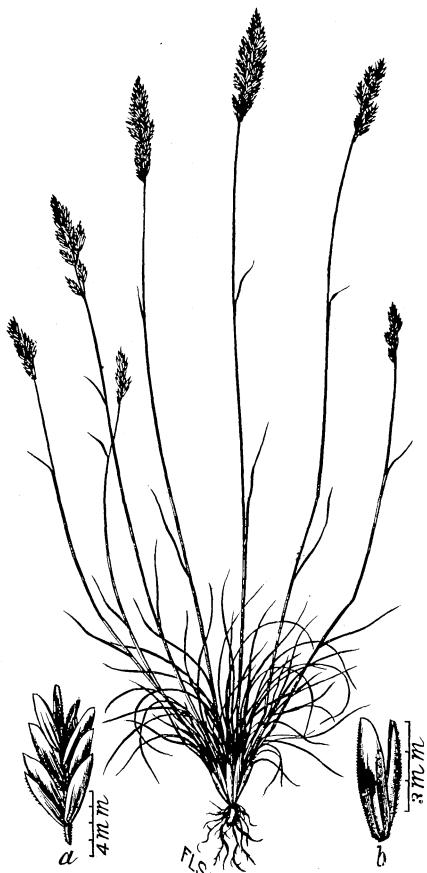


FIG. 11.—*Poa capillaris* Scribn.: a, spikelet; b, floret.

AGROPYRON ELMERI Scribn., sp. n. (Pl. XII.)

A stout, erect perennial, 9 to 15 dm. high, from strong creeping rootstocks, with rather narrow, flat, erect, or ascending leaves and spikes 15 to 20 cm. long. Culms smooth. Sheaths smooth, lower ones longer than the internodes. Ligule about 1 mm. long, minutely fringed along the edge, auricled. Lower leaves 20 cm. long, the upper ones shorter, 4 to 6 mm. broad, strigose-scabrous above, smooth beneath, long attenuate-pointed; leaves of the innovations longer and narrower. Axis of the spike not readily breaking up. Spikelets approximate but not crowded, compressed,

6- to 10-flowered; empty glumes lanceolate, very acute, or subaristate-pointed, rigid, subequal, about 12 mm. long, 3-nerved, scabrous on the nerves. First flowering glume very firm in texture, a little longer than the empty ones, broadly lanceolate, sharply acuminate or subaristate-pointed, 5-nerved, nerves visible only near the apex, scabrous on the back, and covered with a short pubescence which is most conspicuous near the base and margins. Palea nearly as long as the glume, oblong-lanceolate, strongly two-keeled, keels very firm and rigid and minutely aculeolate-scabrous excepting toward the base, apex truncate and minutely pubescent. Stamens 5 mm. long.

On sandy bars and banks, Snake River, Washington, not plentiful (No. 759, A. D. E. Elmer, June, 1897).

This species is chiefly distinguished from *Agropyron spicatum* by its stouter, taller, and straw-like culms and larger spikelets. Some robust forms of *Agropyron spicatum*, as, for example, No. 2271, P. A. Rydberg, July 27, 1895, are hardly to be distinguished from this species, so far as the character of the spike and spikelets are concerned. The coarse, straw-like culms of *Agropyron elmeri* may be due to the nature of the soil in which the plants grew.

AGROPYRON BREVIFOLIUM Scribn., sp. n. (Pl. XIII.)

A slender, densely cespitose species with the smooth culms, which are from 3 to 4 dm. high, usually geniculate at the lower joints, rather short, flat leaves and slender spikes 4 to 8 cm. long. Lowermost sheaths scarious and somewhat purplish, glabrous and smooth. Ligule short, usually with long sickle-shaped auricles. Leaf-blades of the culm leaves 3 to 6 or 7 cm. long, 2 to 4 mm. wide. Those on the innovations somewhat longer and narrower, all very acute, upper surface minutely strigose-scabrous, very smooth beneath. Axis of the spike readily breaking up. Spikelets approximate, usually 3-flowered, 10 to 15 mm. long. Empty glumes subequal, or the first a little shorter than the second, narrowly lanceolate short awn-pointed, 2- to 3-nerved, scabrous on the keel. Flowering glumes of the first floret about 1 cm. long, 5-nerved, nerves slightly conspicuous near the apex, scabrous on the back, especially toward the tip, which is entire or slightly 2-toothed, the midvein extending into an awn 2 to 4 mm. long. Palea as long as the glume, oblong-lanceolate, truncate, minutely aculeolate-scabrous along the sharp keels excepting near the base; the truncate apex minutely pubescent.

Mountain sides, North Fork Bridge Creek, altitude 1,800 meters, Washington State (No. 676, A. D. E. Elmer, September, 1897).

Allied to *Agropyron violaceum*; readily distinguished by its narrower glumes and shorter, narrow leaves.

ELYMUS CAPITATUS Scribn., sp. n. (Plate XIV.)

A stout, coarse, glaucous perennial with loose sheaths, rather broad, flat leaves and densely flowered, ovate or oblong spikes 8 to 15 cm. long. Culms about 6 dm. high, softly pubescent below the inflorescence, otherwise glabrous. Sheaths glabrous, striate, smooth. Ligule very short, irregularly cut and minutely fringed along the edge. Leaf-blades varying in width from 2 or 3 mm. in the sterile shoots to 1 or 2 cm. in those of the culm, attenuate-pointed, glabrous and smooth beneath, strigose-scabrous above, apex very sharp and rigid. Spikelets about 2.5 to 3 cm. long, compressed, 3- to 5-flowered. Glumes finely and closely pubescent, sparingly pilose with longer hairs. Outer glumes lanceolate-acuminate, a little shorter than the spikelet, 2 to 3 mm. broad, with scarious margins. Flowering glumes 20 to 25 mm. long, acuminate-pointed, 7-nerved, with broad scarious margins, apex mucronate-pointed, acute, or slightly rounded; palea a little shorter than the glume, finely and closely pubescent on the back and on the rather broad margins. Grain linear, as long as the palea which loosely embraces it.

Growing with *E. mollis* and other grasses at Homer, Alaska (No. 471, Walter Evans, July 27, 1897).

This striking species is remarkable for its thick spikes, which are 3 to 4 cm. in diameter. The culms are not so tall as those of *E. mollis* growing with it; the spikes are shorter and much thicker. The glumes in *E. mollis* are pubescent with rather long, soft hairs, while the glumes of *E. capitatus* are covered with a very short and close pubescence, which is only visible under the lens. There is a variety of *E. mollis* (*E. mollis brevispicus* Scribn. & Smith) from St. Lawrence Bay which has something of the habit of *E. capitatus*, but the spikes, while only 7 to 10 cm. long, are not so thick, and the glumes are rather densely clothed with a long pubescence very unlike that of *E. capitatus*.



FIG. 12.—*Elymus hansenii* Scribn.: a, empty glumes; b, spikelet with the empty glumes and awns removed.

ELYMUS HANSENI Scribn., sp. n.
(Fig. 12.)

A rather stout, glabrous perennial 9 to 12 dm. high, narrow, spreading leaves and slender, fragile spikes 5 to 8 cm. long. Sheaths smooth, striate. Ligule very short, hardly 1 mm. in length, entire. Leaf-blades 10 to 30 cm. long, 2 to 5 mm. wide. Internodes of the axis of the spike about 1 cm. in length. Spikelets 3- to 5-flowered, about 1.5 mm. long, exclusive of the awns. Empty glumes lanceolate, strongly nerved, tipped with 2, sometimes 3, unequal awns; the longer awns of the empty glumes about 3.5 cm. long. First flowering glume 10 to 12 mm. long, entire or 2-toothed at the apex, terminating in a straight and very slender awn about 5 cm. long. Palea about the length of the glume, minutely scabrous on the sharp keels except near the base, slightly pubescent at the truncate or 2-toothed apex.

Dry, open ground, agricultural station in Amador County, Cal. (No. 1742, George Hansen, June 17, 1896). Allied to *Sitanion elymoides*, but is a much taller grass with narrower leaves, more slender spikes, larger spikelets, broader empty glumes, and awns not divergent. The palea is also much broader at the apex and not awned.

ELYMUS SAXICOLUS Scribn. & Smith, sp. n. (Pl. XV.)

A rather slender, wiry, densely cespitose perennial about 5 dm. high softly pubescent sheaths and leaves and fragile spikes, 5 to 10 cm. long. Culms pubescent excepting where covered by the leaf-sheaths. Sheaths pubescent. Ligule very short, scarious, auricled. Leaf-blades 10 to 20 cm. long, the uppermost 5 to 6 cm. long, long attenuate-pointed, 3 to 4 mm. wide or less, strongly striate above and pubescent on both sides. Axis of the panicle strongly compressed, readily breaking up. Spikelets solitary or in pairs, 2- to 5-flowered, about 1.5 cm. long exclusive of the awns. Outer glumes narrowly lanceolate, 1- to 3-nerved, about 6 mm. long. Awn slender,

divergent, 1.5 to 2 cm. long. First flowering glume about 1 cm. long, smooth or slightly scabrous near the apex, rather broadly lanceolate and gradually tapering into a slender, flexuous, more or less divergent awn, 2 to 2.5 cm. long. Palea as long as its glume, finely aculeolate-scabrous on the keels. Apex rounded-obtuse or truncate and pubescent.

Among bowlders and rocky crevices on the summit of Mount Chapaca, altitude 1,900 meters (No. 554, A. D. E. Elmer, August, 1897). Distributed as *Agropyron saxicolum*. This grass was at first taken to be a species of *Agropyron*, but an examination of further material determines its position as an *Elymus*. In many of the spikes the spikelets are all solitary, but the position of the first flowering glume in being slightly turned to one side in its relation to the main axis is a character of the genus *Elymus*, and there are frequently entire spikes where the spikelets are all in pairs as in the typical species of the genus. The soft, hoary pubescence and slender divergent awns are the most striking characters of this species.

ELYMUS CILIATUS Scribn., sp. n. (Pl. XVI.)

A rather slender, erect perennial about 7 dm. high with soft, flat leaves and slender, nodding spikes, 7 to 12 cm. long. Culms very smooth. Sheaths smooth, striate. Ligule less than 1 mm. long. Leaf-blades linear, lanceolate, 12 to 18 cm. long, nearly 1 cm. broad, scabrous on both sides and especially on the margins. Axis of the panicle strongly scabrous. Spikelets about 1.5 cm. long, exclusive of the awn, 2- to 3-flowered. Empty glumes lanceolate, 3-nerved, about 8 mm. long exclusive of the awn, which is 3 to 4 mm. long; the outer pair of glumes ciliate near the apex, the inner pair usually naked. The first flowering glume about 1 cm. long, 5-nerved, nerves prominent near the base, ciliate-pubescent along the margins, especially near the apex. Awns straight or somewhat flexuous, 2 to 2.5 cm. long. Palea about as long as the glume, finely aculeolate-scabrous along the margins near the 2-toothed apex.

Common in wet places, Sitka, Alaska (No. 210, Walter Evans, June, 1897; No. 1724 Howell). This species is related to *Elymus sibiricus*, from which it is distinguished by its longer and broader outer glumes and the ciliate margins of the flowering glumes. This latter character serves to distinguish this species from all others with which the writer is acquainted.

ELYMUS SIMPLEX Scribn. & Williams, sp. n. (Pl. XVII.)

A rigid species, 3 to 4 dm. high, the erect stems from strong, creeping rootstocks, with flat, pungently-pointed rigid leaves and densely flowered spikes 5 to 8 cm. long. Culms branching at the very base, growing in thin, scattered tufts. Lower sheaths crowded, exceeding the internodes, glabrous and smooth. Ligule very short, auricled. Leaf-blades 4 to 10 mm. long, 3 to 6 mm. broad, becoming involute when dry, smooth the lower surface strigose-scabrous above, the very sharp, involute tips straw-colored. Axis of the panicle scabrous, strongly flattened and scabrous on the edges, not readily breaking up. Spikes solitary or in pairs, sessile and shortly pedicellate, slightly compressed, usually crowded, rarely remote, about 1.5 cm. long, 5- to 7- (or more in var. *luxurians*) flowered. Empty glumes slightly unequal, very rigid, the longer one about 1 cm. in length, narrowly lanceolate, very rigid and long subulate-pointed. First flowering glume about 7 mm. long, rounded on the back, smooth, more or less glaucous, extending into a rigid awn, 5 to 6 mm. long. Palea deeply sulcate toward the base, about as long as its glume, aculeolate-scabrous on the strong keels, excepting near the base. Apex narrow, minutely 2-toothed, very minutely scabrous or subpubescent on the back.

Type specimen is represented by No. 2334, Thomas A. Williams, collected on banks of Green River, Wyoming, July 8, 1897, altitude 1,800 meters. No. 2366 of the same collection belongs here. This was collected on edges of ponds and along river bottoms in the same vicinity, growing with *Distichlis spicata*.

ELYMUS SIMPLEX var. **LUXURIANS** Scribn. & Williams, var. n.

Is glaucous throughout with stouter culms, longer and broader leaves and narrower panicles, which are often branched, and with spikelets sometimes 10- to 12-flowered. This variety is represented by No. 2338, Thomas A. Williams, which was found growing in rich soil along streams, common near Green River, Wyoming, July 8, 1897.

ELYMUS HIRSUTIGLUMIS Scribn., n. n., *E. intermedius* Scribn. & Smith; Bull. 4, Div. Agros. 38 (1897), not *E. intermedius* Bieb., Flor. 1:82.



EXPLANATION OF PLATES.

PLATE I. *Panicum linearifolium* Scribn.: *a*, spikelet seen from the anterior side; *b*, spikelet seen from the dorsal side showing second glume; *c*, anterior face of third glume showing imperfect palea; *d*, dorsal view of flowering glume; *e*, anterior view of flowering glume showing palea.

II. *Panicum equilaterale* Scribn.: *a*, spikelets seen from the anterior side showing first and second glumes; *b*, spikelet seen from the dorsal side showing second glume; *c*, lateral view of spikelet showing base of the fourth glume; *d*, third glume, with the palea; *e*, flowering glume, dorsal view; *f*, anterior view of fourth glume showing palea.

III. *Chatochloa latifolia* Scribn.: *a*, spikelet seen from the side showing bristle; *b*, spikelet seen from the anterior side showing first and second glumes; *c*, spikelet seen from the back showing base of first glume, back of second glume, and apex of fourth glume; *d*, dorsal view of fruiting glume.

IV. *Stipa williamsii* Scribn.: *a*, empty glumes; *b*, floret.

V. *Sporobolus palmeri* Scribn.: *a*, empty glumes; *b*, spikelets with the empty glumes removed.

VI. *Zeugites pringlei* Scribn.: *a*, spikelet showing one perfect and one staminate floret; *b*, empty glumes of the spikelet; *c*, flowering glume of the female floret with the awn partly removed showing a joint of the rachilla at *g*; *d*, dorsal view of the first empty glume; *e*, dorsal view of the second empty glume; *f*, palea of the female floret.

VII. *Eragrostis viscosa* Scribn.: *a*, empty glumes; *b*, spikelet with the empty glumes removed; *c*, palea.

VIII. *Poa juncifolia* Scribn.: *a*, empty glumes; *b*, florets of spikelet seen from the side; *c*, dorsal view of flowering glume; *d*, palea; *e*, base of leaf and upper portion of sheath showing palea.

IX. *Poa hansenii* Scribn.: *a*, empty glumes; *b*, three florets seen from the side; *c*, ligule.

X. *Poa atropurpurea* Scribn.: *a*, empty glumes; *b*, four florets seen from the side; *c*, single floret seen from the side.

XI. *Poa longepedunculata* Scribn.: *a*, empty glumes; *b*, three florets seen from the side; *c*, base of the leaf and portion of sheath showing ligule.

XII. *Agropyron elmeri* Scribn.: *a*, empty glumes; *b*, spikelet with the empty glumes removed.

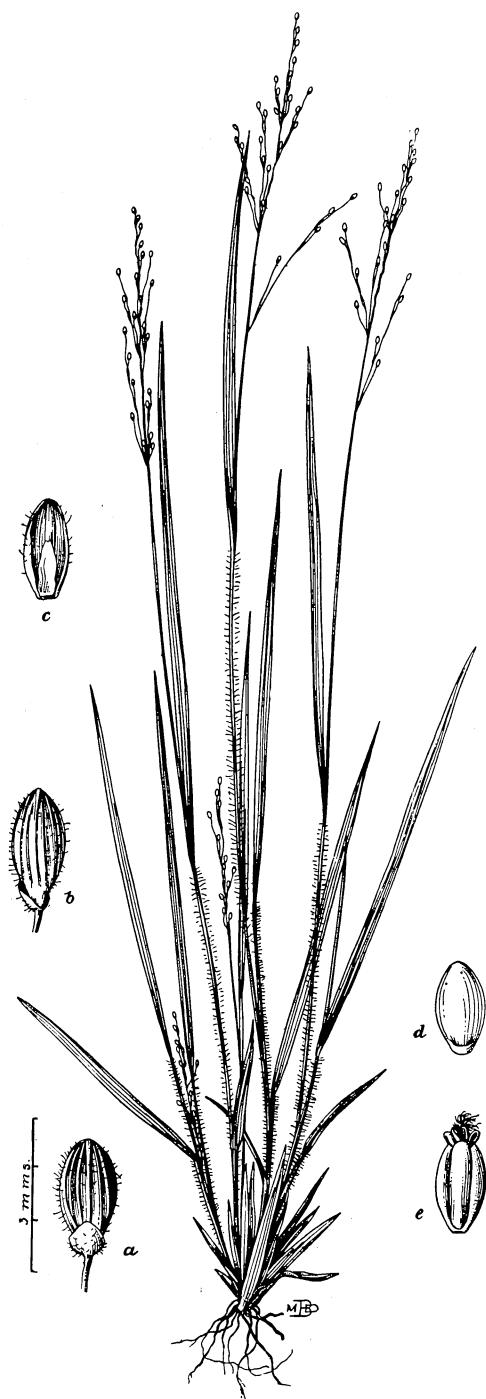
XIII. *Agropyron brevifolium* Scribn.: *a*, empty glumes; *b*, spikelet with the empty glumes removed.

XIV. *Elymus capitatus* Scribn.: *a*, spikelet; *b*, one of the florets.

XV. *Elymus saxicola* Scribn. & Smith: *a*, a pair of empty glumes with the awns removed; *b*, spikelet with the empty glumes removed and the awns partly cut off.

XVI. *Elymus ciliatus* Scribn.: *a*, empty glumes; *b*, florets with the awns partly removed.

XVII. *Elymus simplex* Scribn. & Williams: *a*, empty glumes; *b*, spikelet with the empty glumes removed.



PANICUM LINEARIFOLIUM SCRIBN.



PANICUM EQUILATERALE SCRIBN.



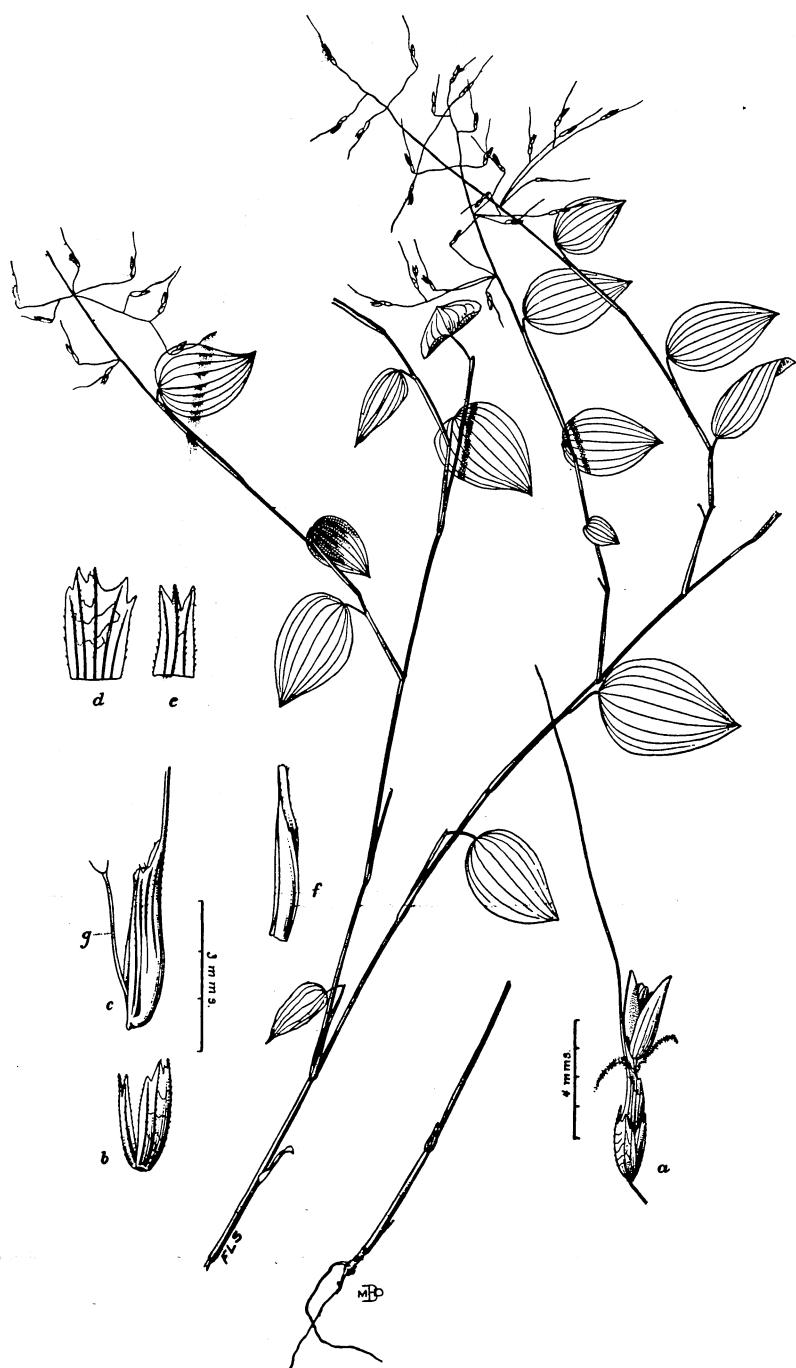
CHÆTOCHLOA LATIFOLIA SCRIBN.



STIPA WILLIAMSII SCRIBN.



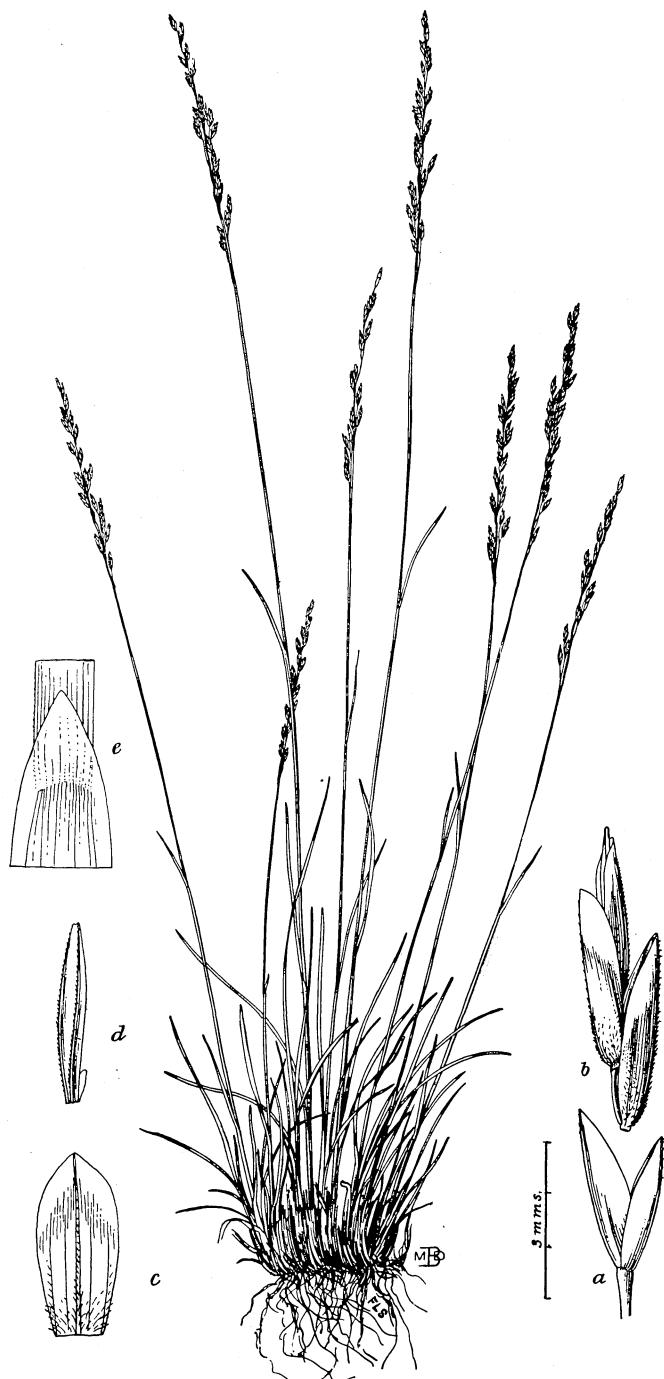
SPOROBOLUS PALMERI SCRIBN.



ZEUGITES PRINGLEI SCRIBN.



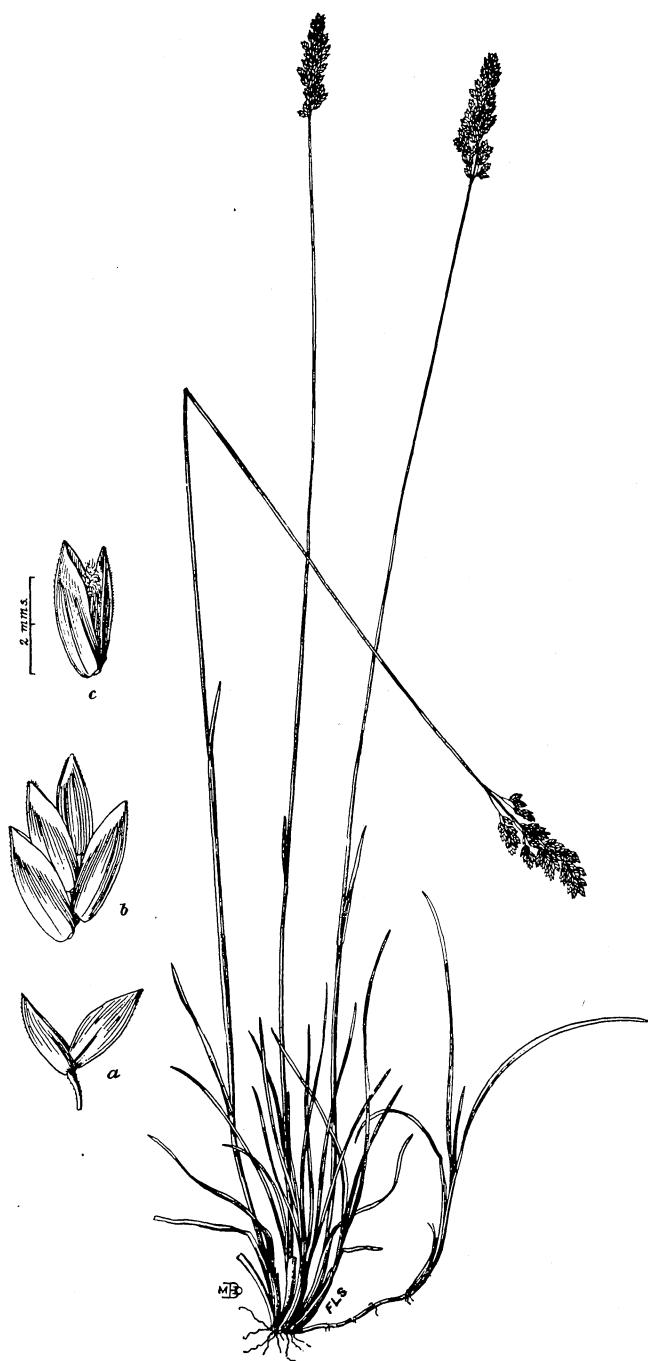
ERAGROSTIS VISCOsa SCRIBN.



POA JUNCIFOLIA SCRIBN.



POA HANSENI SCRIBN.



POA ATROPURPUREA SCRIBN.



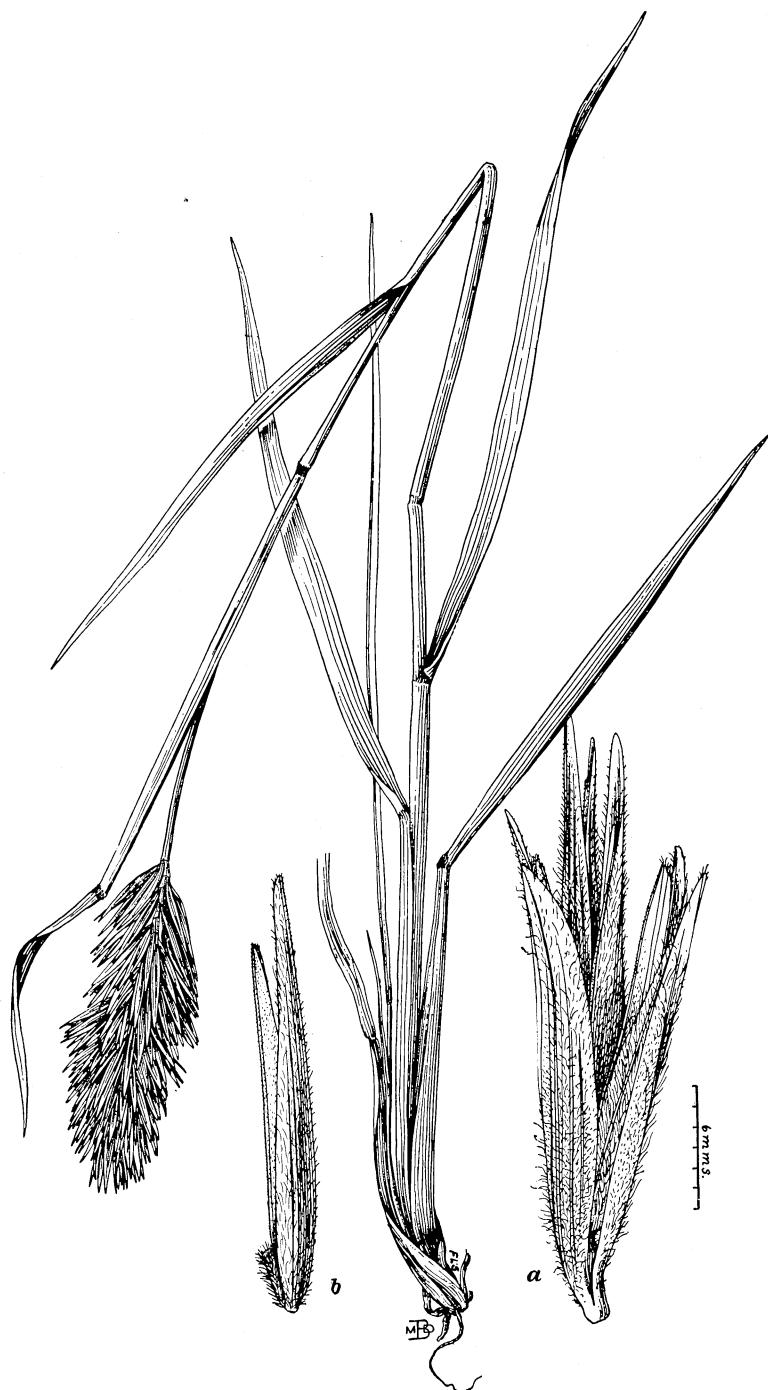
POA LONGEPEDUNCULATA SCRIBN.



AGROPYRON ELMERI SCRIBN.



AGROPYRON BREVIFOLIUM SCRIBN.



ELYMUS CAPITATUS SCRIBN.



ELYMUS SAXICOLUS SCRIBN. AND SMITH.



ELYMUS CILIATUS SCRIBN.



ELYMUS SIMPLEX SCRIBN. AND WILLIAMS.

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